WORK

An Illustrated Journal of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

A CIRCULAR saw of an original design has just been brought out. It will cut and plane simultaneously any kind of wood by the same action as an ordinary circular saw, the result being a very smooth surface.

* *

Fire escapes are welcome. A new one consists of a light iron balcony which is affixed to a French or other window. On the floor of the balcony is a trap-door, which, on being raised, causes a telescopic ladder to slide down to the ground, thus affording a simple and novel means of escape.

* *

A considerable number of voting machines have been patented both in this country and America, and in the latter one has now been brought into use. The voter presses a knob labelled with the name of the candidate he supports; the registering is automatic. The votes given for sixty-four candidates were counted in ten minutes at the close of the poll.

* *

A novel method for connecting metal pipes to earthenware sanitary goods consists of lead union sockets or joints. They are cast with a thread, and a corresponding thread is made on the closet traps and other fittings; a thin coat of paint is stated to be all that is required to make a perfectly sound joint. We await with interest the result of more extended use of these fittings.

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An Aberdeen engineering firm has effected a curious alteration in its working hours. Previously the hours, all over the trade, were from 6 a.m. till 5.30 p.m., but till 1.30 p.m. on Saturday, thus making a 9½ hours' day and a 54 hours' week. These hours have been altered to from 6 a.m. until 5 p.m., and until 10 a.m. on Saturday, thus giving the workmen nearly a whole Saturday, and still keeping the number of working hours in the week at 54.

* *

One of the greatest railway engineering feats of modern times was the alteration in the gauge of the Great Western Railway from Exeter to Plymouth. Two days only—Saturday and Sunday—were allowed for the alteration from broad to narrow gauge of 160 miles of line, and 5,000 experienced men were engaged in the work, which was carried out during the night as well as the day. Hundreds of tents for sleeping in were pitched alongside the line, and the traffic was suspended during the two days, arrangements being made for carrying the mails by post coaches.

* *

The Worshipful Company of Saddlers of the City of London has arranged for an important exhibition, to commence June 10, of old and historic saddles from various parts of Europe and this country. We shall see the sort of saddles cavaliers of old used and maintained their seats, with a half or three-quarters of a hundredweight of iron cased over them. Our hunting men may, perhaps, be able to compare the modern saddlers' saddles with them, and find out how so many expert riders, on the best horses, at little fences, are killed or disabled for life.

* *

A new wheel of an enduring stamp for heavy work or extra hard wear is now being made. The ordinary wood naves and spokes are fitted with T-shaped girder tires that need no wooden felloes. The spoke ends are fitted with flanged sockets, the flanges being riveted through the mid-rib of the tire. The hardest wear cannot expand these tires, so the cost of contracting the tires and re-jointing felloes, so frequently necessary with ordinary wheels, is obviated. Special steel is used, and the welding done by electricity, which makes an economy in first cost as well as in the double or treble durability of the wheel.

* *

Old amber beads are often of a very beautiful colour, almost like gems in fact. This colour is produced by age, and is an alteration of the surface of the amber—it does not penetrate into its substance. If the surface is removed by being polished, then the colour goes too, and with the colour much of the beauty and value. Since the surface cannot be interfered with without removing a property it may have taken fifty years to produce, it follows that scratches or breaks are better left in, and they should be unless the owner gives explicit orders to repolish, after he has been warned of the change that will take place. It is rare that repolishing spoils an article, but it would do harm in this one case, however it might improve the other nine hundred and ninety-nine articles out of a thousand.

* *

If proof were wanting of the usefulness of, or the enterprise in connection with, telegraphic resource, the last Oxford and Cambridge boat-race would afford an instance. The boat conveying the representatives of the press, which followed after the rival crews, carried on it a telegraphic instrument and a few miles of coiled cable. The one end of the latter was fastened to the instrument on board, the other to an instrument at the nearest telegraph office on land. Then, as the boat steamed after the crews, the cable was paid out, and all the time messages describing the race at various points were cabled to the Press Association offices, in each case within a minute after the crews actually passed them. The result was, many of the London clubs had almost continuous information about the race while it was going on; and newspapers with full accounts of it were being sold six minutes after Oxford passed the winning post.

* *

Many engineers having to drill and tap a hole, employ a drill just the size of the tap at the bottom of the thread. This is altogether a bad practice. The hole, say, that a $\frac{7}{8}$ in. stud has to go into should be ·77 in., or $\frac{1}{25}$ of an inch larger than the tap at the bottom of the thread. In the operation of tapping, the tap does not cut at the extreme bottom of the thread, but other parts of the tap force the material—whether forged steel, wrought iron, soft brass, or copper—into form. Thus, after the tap comes out of the hole the diameter at the bottom of the thread is ·73 in., or smaller than it was before the tap went in. In the case of cast iron this rule should be strictly observed, so that the thread can be *cut* and not pressed into shape. If the hole is drilled the exact size of bottom of thread, the material being forced up will likely weaken the thread and cause it to break away. The best form for the thread in metal poles is for the bottom of the thread to be slightly flat.

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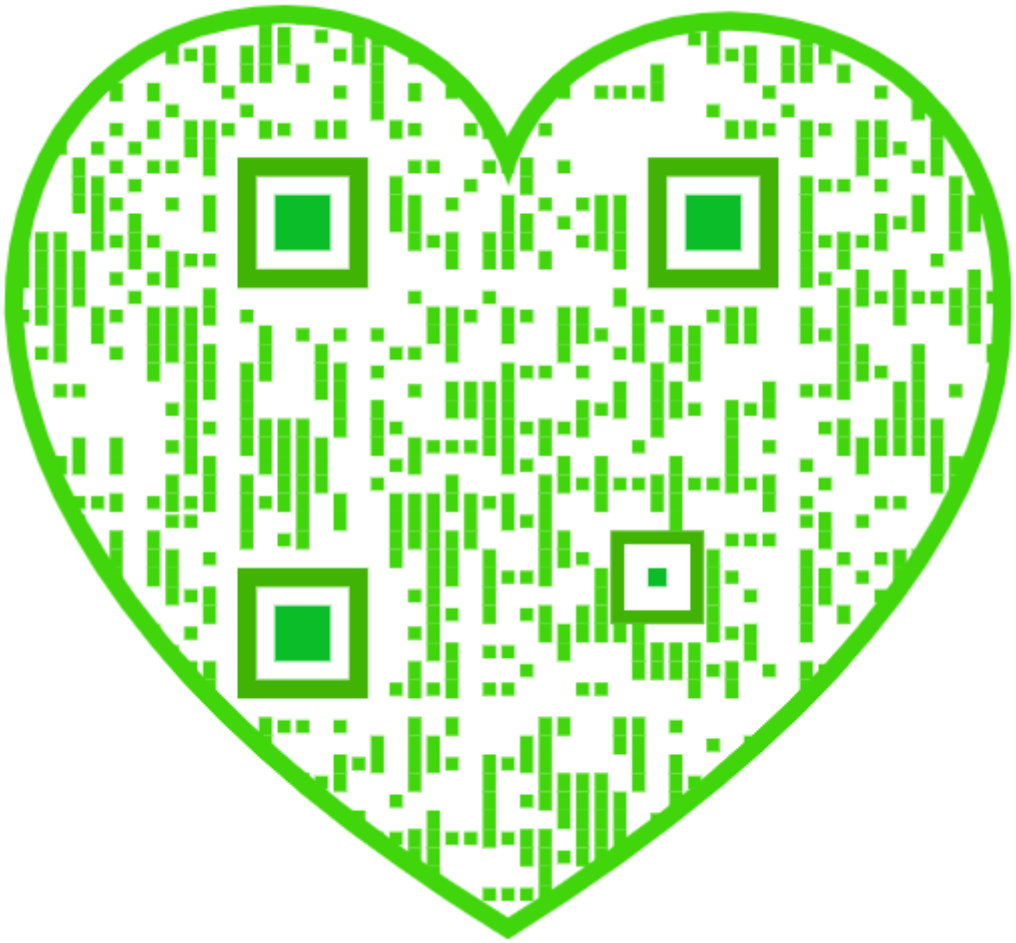

The Severn navigation improvement now affords means of carrying iron from Staffordshire to Bristol in barges taking over 100 tons of cargo, and drawing 6 ft. 3 in. of water. Iron is also being taken down the canal to Worcester.

* *

The supply of water from Lake Vyrnwy to Liverpool will commence about the middle of this month. It has been a really gigantic undertaking, and is now on the eve of completion. That Liverpool has taken a step in the right direction is shown by the action of Manchester, Birmingham, and London, who are all thirsting for a little of the dew off the mountains. The undertaking to supply Manchester with water from Thirlmere is already progressing.

* *

Datchet possesses veritable apostles of art in the Misses Palmer. Those who remember the first beginning of the embroidery class they started among the village girls, and the simple cotton smock sent to the Home Arts and Industries Exhibition—the first time they sent specimens of their work, was it four or five years ago?—and have watched the gradual progress from season to season up to the production of the exquisite Greek lace, needlework of various kinds, delicate smocking and embroidery, of which large quantities are now exhibited and sold every year, have a splendid proof of what, under able and artistic instruction, our village people may show themselves capable. The recent Industrial and Art Exhibition, consisting of exhibits confined to the work of the villagers of the place, was exceedingly creditable.

SEWING MACHINES: HOW TO BUY AND USE THEM.

BY CYCLOPS.

Introduction.—The history of machinery, from the very earliest period down to the present day, has been a history of rapid advancement. In whatever branch of science we study, we find that there have been inventions and discoveries which have been at once the stepping-stones and landmarks of its rise and progress.

Of all mechanical inventions we are bound to give to the steam engine the foremost place; for in it we see the laws of nature subjected and applied to the requirements of man in the most important direction—the concentration of energy into motive force; and what the steam engine is in our workshops, the sewing machine has become in our homes.

Over all domestic machinery and appliances the sewing machine stands pre-eminent. In its present perfect form it is the outcome of years of careful study and experiment, and as a piece of mechanism swift, sure, and yet delicate in its action, it is without a rival.

While the immortal Howe was spending the best years of his life in the invention and construction of a "machine to sew," the "Song of the Shirt" was being sung over the wretched employment of the seamstress, accomplishing, by sheer manual yet sedentary work, what was destined, through the labours of that great inventor, to be in the future accomplished swiftly and surely by the application of machinery. The first sewing machine of Howe, when looked at by the side of the present perfected form of machine, falls into insignificance. Its complicated details of construction—details far more complicated than are to be found in the best machines of to-day—accomplish very little more than was accomplished by the old method of hand-sewing; yet in it we see the first application of mechanical laws to do the work which was formerly done by what had become the almost instinctive action of the human hand.

The ice was broken, and inventors were not slow to follow up the scent, and contrive improvements on Howe's system, which gradually brought the sewing machine into the position in which we see it to-day.

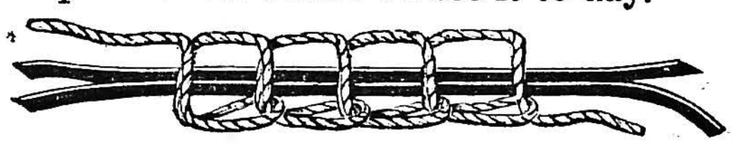

Fig. 1

Fig. 2

Fig. 3

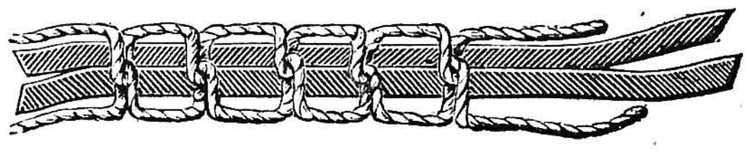

Fig. 4

Fig. 5

Sewing Machines. Fig. 1.—Wilcox and Gibbs' Chain-Stitch: Section through Sewing. Fig. 2.—Ditto, ditto: Top View of Stitch. Fig. 3.—Ditto, ditto: Under View of Stitch. Fig. 4.—Lock-Stitch: Section through Sewing. Fig. 5.—Top and Under View of Lock-Stitch.

Object of these Papers. — The sewing machine has become such an indispensable piece of furniture in every house, that a series of articles giving some information on its various principles and construction will, no doubt, be of interest to the many readers of WORK; and in bringing before your notice the following remarks on sewing machines and their maintenance, the writer hopes that they will be useful to readers at least in two ways. First, to those who have anything at all to do with sewing machines they will give some insight into the working, adjusting, and repairing; and secondly, to those who may not have anything to do with these interesting machines, but who may be wishful to make themselves acquainted with the principles which govern their action, they will, no doubt, be of service.

Two Leading Principles. — The great principle of all sewing machines is the binding together of two or more textile fabrics, or parts of textile fabrics, by means of a thread or threads; and in the consideration of the principles in which sewing machines work, they are naturally divided into classes by the manner in which the cotton or thread is manipulated to obtain the desired result. So that we can at once set out by dividing machines into two classes: those producing work by what is called the chain-stitch, and those producing it by what is known as the lock-stitch.

Chain-Stitch. — Chain-stitch is distinguished from lock-stitch by its necessitating the use of only one thread, which, by the action of the mechanism of the machine, twists itself into the material to be operated upon in such a manner as to give on one side the impression of a chain. Fig. 1 shows the formation of the stitch through the material, Fig. 2 shows the top view of stitch, and Fig. 3 shows the bottom view.

It will not be necessary for us to go any further into a description of the formation of this stitch here; it will be fully described in our second paper on the Wilcox and Gibbs' machine, which is really the only well-known chain-stitch.

Lock-Stitch.—In this principle there are two threads employed, the top contained on a bobbin and running through the needle, and the bottom contained in a shuttle, which runs through loops formed by the top thread, or in a spool round which the top thread is directed by the hook-holder which carries the spool. These two threads lock each other in the centre of the material, hence the name "lock-stitch."

Of these machines there are an innumerable variety on different principles. Some have reciprocating shuttles carrying the bottom thread, some have rotary shuttles, and some have stationary shuttles or spools. These will be treated under their different headings further on.

The formation of stitches on the lock principle is illustrated in Figs. 4 and 5. Fig. 4 shows the formation through the material, and Fig. 5 the appearance of the stitch on the top and under side, which are, when properly adjusted, both alike.

In our next paper we shall deal exclusively with the Wilcox and Gibbs' chain-stitch sewing machine, which, in its construction and arrangement, is a really beautiful sewing machine.

AN ORNAMENTAL SHELF BRACKET.

BY J. LUKIN.

THE present design is introduced to call the amateur's attention to a system of decoration in which the lathe as usual bears an important part, not in respect to pilasters and similar cylindrical work, but in the preparation of mouldings and surface or plankwise turning. This is, perhaps, as easy as the other method, but not unless a judicious selection is made of the material to be used. Deal, for instance, although it may be pressed into service, is of too loose and open grain to allow fine mouldings to be cut clearly and sharply plankwise. Soft woods may be used, but only those of close grain can be moulded, even with sharp tools, without having recourse to that bane of good turning—sand-paper.

Of course, one may be frequently obliged to use unsuitable stuff, but if any fair quantity of turnery is proposed, it will always pay an amateur to buy what he really needs for his work, especially as none of the soft woods are expensive. Horse chestnut is a capital wood for many such works as that under consideration. It cuts clean, is not brittle, it will serve for screws to be cut in a screw box or in the lathe with a V tool, and it can be bought without difficulty at the saw mill.

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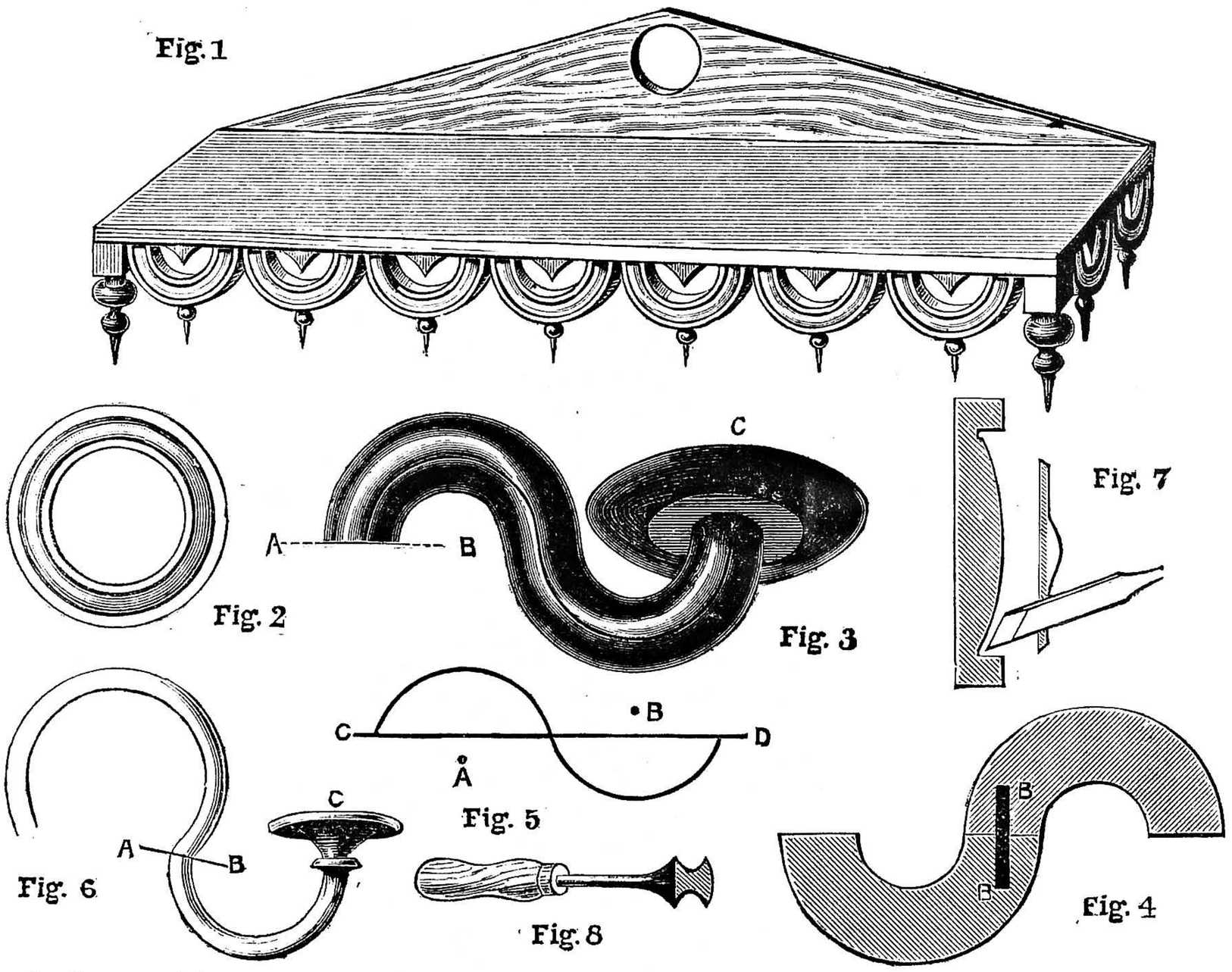
Then there is sycamore, largely used for making bread platters—silvery white or darker creamy white, according to age. It cuts well either plankwise or on the cylinder. There is little need in this cricketing age to declare the merits or to describe the peculiarities of the willow, of which the cricket bat has long been manufactured. It turns well, and is soft and easy to cut, while the grain is close and even—and in these qualities it is closely allied to the lime. Either of the above is preferable to deal for face work, and all are largely used by the soft wood turner. Just now it is the fashion to ebonise furniture of various kinds, brackets and shelves included, and it is for this reason that those woods should be selected which show but little of their fibrous nature; ebony being of that uniformly black and even surface which cannot be imitated by coating with a black stain wood which has a figured or conspicuous grain.

I might have included in the list of suitable woods both beech and birch, the latter being the softer of the two; but these have more conspicuous grain, and are better suited for work that it is not proposed to ebonise.

These are very valuable woods, and for general purposes can hardly be surpassed. There is, therefore, ample choice of material, obtainable at low cost, either in London or in the country; nor is there any great difficulty in obtaining it dry and well seasoned. So now let us get to work.

The bracket shelf entire is shown in Fig. 1. The size is unimportant, as it is made, generally speaking, to fit into a space designed for it. I may state here, however, that if designed for a study, and intended to be something more substantial and useful than a mere bracket, it should be entirely of oak, polished or otherwise, and the actual shelf ¾ in. thick to 1 in., according to length and width proposed. No oak furniture will look well if of thin stuff—oak suggesting massiveness and solidity.

We are, however, supposed just now to be dealing with material less substantial, and which may, therefore, be thinner. Deal will answer well for shelf and back, and one of the other woods for the semicircular pieces of the hanging border. It is of the latter that I wish to treat in detail, as they open up a field of special design. To form them as drawn here, a piece of board is to be taken and a square of it cut off, from which the corners had also better be removed or they may strike the lathe bed. As to size, the height of lathe centres will set a limit in one direction, and with regard to thickness it should be that of the shelf, so as to admit of somewhat deep cutting to produce bold and handsome-looking mouldings. Mount the piece on the taper screw chuck, taking care that it beds down truly against the face, and level the wood with a gouge. If it is a bit of planed stuff a light cut all over should suffice for this. Now determine the outside measurement, and at the point thus decided apply a parting tool held horizontally upon the rest, and cut a circular groove. Shift the tool its own width from time to time, to give it ample room, sideways, that it may not jam itself and get broken; and, thus deepening the cut, the outside part will soon be severed in one piece, leaving a circular disc for the formation of the necessary ring, shown in a finished state in Fig. 2. In the remainder of the work I must premise the possession of very keen tools—gouge and chisel. It is of no use to try and turn face work unless the bevels are long and flat. A short bevel to either gouge or chisel will answer perfectly for hard wood but not for soft, and a rounded bevel cannot be made to produce a keen edge by application to the oilstone. To proceed, turn the edge of the disc, where it was left somewhat irregular by the parting tool, quite smooth and level. Gauge the size with the callipers or a band of paper or tape, and keep an exact record of it as a guide to the size of all the other pieces required. Decide also upon the width you wish to give the moulding, hold a pencil against the face of the piece, and mark the width as it revolves in the lathe. At this mark apply the parting tool and cut a fairly deep groove, but not so as to obliterate the pencil mark, nor so deep as to endanger cutting through the wood. Now with the same useful tool mark the outer and inner fillets between which a rounded part appears in the drawing. A carver's V tool or a *soft* wood parting tool will do this even better; but that used for hard wood will do almost equally well, especially as these grooves are made merely to define the position of the mouldings, and to form a guide for the gouge and chisel. Let the fillets in this case remain flat and of square section, and round the central part only. Lay the chisel quite flat upon the rest, just touching, at first, the highest part of the curved surface, and from this position carry its keenest angle gradually down on one side of the curve, so that this edge may clean out the angle following the groove cut by the parting tool (see Fig. 7). Then turn over the tool and work into the other angle. Let there be no undue hurry, and let the cuts be light; and for the final ones, after the rounded part has become nicely formed, *begin* at the lower part with the keen angle, as before, in the groove, and work with a steady traverse *up* to and just beyond the summit; then turn the chisel over and begin in the same way in the other angle, and proceed till the cut made beyond the centre is just met and passed. This should make a good surface of the rounded part, but if not take another or more cuts either way till the contour is an even curve with no flat at the top or side, and then turn your attention to the outer fillet, of which the inner edge will want a touch of the chisel to finish it. This can be done in an instant if the chisel is set on its edge upon the rest, but I may warn the reader of danger of a "catch in," and rather advise that the tool be still laid flat upon its side so as to use the acute angle of it only. If needed it must now be papered, which will be of no hurt to a rounded surface like the present, and if a bit of the finest No. 00 is used, and folded sharply, it can be also made to enter and clean up the deeper part. But sand-paper, remember, will not render even a badly cut surface, and if flats were left flats will become visible in certain lights, therefore, let due care be taken not to produce them by an unskilful use of the chisel. Speaking of this tool leads me to observe that if the original piece of wood is unduly rough, or a larger moulding needed, such as in the decoration of substantial oak shelves, it will be necessary to commence with the gouge, which must be upon its side with its hollow towards that part which it is approaching, so if cutting, as in Fig. 7, down the left side of the rounded part the hollow will also be towards the left. But care must be taken when it gets down into the angle not to let its edges catch and tear the face of the adjacent fillet. This will to a certainty happen if they come into contact with it. The entire ring has now to be separated by deepening the cut first made by the parting tool. The inside disc or core may, of course, be sacrificed, and therefore



An Ornamental Shelf Bracket. Fig. 1.—Ornamental Shelf Bracket. Fig. 2.—Turned Ring ready for cutting. Fig. 3.—Ring cut and re-united. Fig. 4.—Section of same. Fig. 5.—Rings cut on a Diameter. Fig. 6.—Rings cut beyond Diameter. Fig. 7.—Position of Chisel. Fig. 8.—Ring Tool.

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the groove may be widened towards the centre as the cut proceeds, so as to allow the cut to be made clean and true on the ring part. If carefully done, matters may be so managed that when at last the ring falls off it will need no more to be done to it, otherwise it will have to be again mounted in a hollow or cup chuck of wood or metal in order to still further finish the inside edges. If it is so intended, the best plan is to use a wooden barrel stave chuck with outside rings, which will securely hold all the rings in succession. A self-centring iron chuck of sufficient size is too heavy for a good lathe, and should not be used if it can be avoided.

The ring thus finished, as many copies of it are to be made as required, *i.e.*, half the number of the semicircular pendants which form the border of the bracket, and these are to be sawn across the diametrical line quite squarely into halves, so that all shall be exactly alike. There is no difficulty in doing this accurately, but it may be facilitated by marking out upon a sheet of paper a circle of the same size as the ring, drawing a diametrical line through its centre, and then, standing the ring upon it, pricking upon each side the ends of this line, and by the help of a set-square marking on both faces and edges of the ring the guide line for the saw cut. Such line may be marked, if preferred, while the work is in the lathe, before the final cut is taken, the T of the rest raised to height of centre serving to rule such mark across its face. In any case use a square to carry the line down and across the edges, that the cut may be accurately square to the face of the work, otherwise the semicircular pieces, when glued on, will not lie in the same plane, but will lean this way and that and spoil the appearance of the shelf. There is little that need be said about the corner pendants, which are turned in the usual way, as are also the smaller ones depending from the semicircular pieces; but the latter should have short lengths of wire or needle points inserted to secure them while the glue is drying by which they are attached. The corner ones will have a good square base and will need no such pins, especially as the shelf will be laid bottom upwards on the bench while these ornaments are being fixed in place. The small triangular pieces may be of $\frac{1}{2}$ in. wood. They greatly add to the effect by reason of their sharp angles and straight sides contrasting with the rounded forms of the adjacent mouldings. They are, of course, glued on, but it will be better to leave them till the rest are dry and incapable of displacement.

Such are the details of the shelf bracket, which will well repay the care and trouble needed to execute it in a satisfactory manner; but I have added a suggestion or two of other work requiring similar treatment so far as the lathe is concerned, such pieces forming the basis of a great number of designs in ornamental woodwork. They have, moreover, this advantage over the more elaborate ornamental turning, that they need no expensive chucks, tools, or other apparatus, but can be made by means of any plain and cheap lathe. Fig. 3 might represent the curved arm of a circular shelf to support a candlestick or vase of flowers, or might be the arm of a candelabrum, represented again in a lighter form in Fig. 6. This is turned in a manner similar to the ornaments of the bracket shelf, but entirely rounded like a large wooden curtain ring (which is similarly made). It may, however, if preferred, take the form of Fig. 2, but with precisely similar mouldings on both faces, the piece being reversed for this purpose in the chuck so as to bring the second face under the action of the turning tools. If, however, the form of Fig. 3 is to be followed, it will be necessary, after working both faces, to place the ring upon a wood mandrel or outside a chuck in order to finish more neatly the outside part of the curved surface. It may even need to be mounted, finally, inside a barrel stave or cup chuck so as to get at the inside of it. These rings, however, if made of hard wood, are formed by what is called a ring tool. This is a double bead tool like Fig. 8, one edge cutting the outside and the other the inside of the ring each to a true semicircular section. For stouter work and soft wood this tool is unsuitable, and the chisel and gouge are often followed by the rasp and file after the work has been removed from the lathe, sawn in half and glued together. To secure the parts glue alone is not sufficient, but a pin must be inserted, as seen in the section Fig. 4. The hole for this must be very carefully made at right angles to the sawn faces, which will not otherwise get truly together. Made thus, the whole serpentine arm is as strong as if it consisted of one solid piece. Fig. 5 is drawn to show the effect upon the entire curve of sawing off a part of each after dividing the ring into two pieces; A and B are here the centres, but only the part above and below the line C D is used. This makes a nicer curve than that formed by two entire semicircles. In Fig. 6 another effect is produced by making use of two different sized rings and taking of each more than the semicircle. The arches being thus of a horseshoe form, there is an angle or elbow at the line A B. Sometimes at the part where the pieces join there is inserted a round disc of wood, and at other times a round ball is bored so as to slip on and conceal the joint. It must, of course, be placed in position at the time the pieces are being glued up. Many devices are used to lend variety to this class of work, and there is ample room for the exercise of taste and skill; but in all cases it is of paramount importance to ensure good and close contact between the ends of the semicircular parts, as no more than a faint line should be visible at the junction. For this reason, too, the glue must be good and somewhat thin, not daubed on as a sticky mass, which does but keep surfaces apart, but laid on neatly with a small brush while it is boiling hot, and all that runs out of the joint is to be at once wiped off with a bit of sponge dipped in hot water. Such curved work cannot be clamped together but may be pushed up close by hand, and if it is well fitted the peg or pin will hold it securely till dry.

BOOT AND SHOE MAKING.

BY WILLIAM GREENFIELD.

BUYING THE TOPS (OR UPPERS)—SELECTION OF LEATHER FOR THE BOTTOMS—THE WAY TO WET, FLESH, DRY, BUFF, AND HAMMER IT—TO FIT INNER SOLES, STIFFENERS, AND SIDE LININGS—EXPLANATION OF TERMS AND TOOLS.

Buying the Tops (or Uppers).—Fig. 1 is a gent's lace (or Balmoral) boot. No. 3, for light work, is cut from calf-kid, levant, seal, memel, calf, etc., and 4, 5, and 6 are cut from French calf, krup, patent, etc. For stouter work, we use English calf, porpoise, etc.; and for very heavy best work, memel, cowhide, stout porpoise, neat's, etc. For rough working kip is employed. I only illustrate this kind of boot, but there are many others, such as button, elastic, bluchers, Derby bals., etc.

Lace shoes (Fig. 2) are termed Oxford shoes. Then there are button shoes, elastic shoes, tie shoes, etc. The following list indicates the prices of a few of the most generally used uppers:—

	s.	d.		s.	d.
Gent's bals., kid leg, calf (French), gol. and cap	5	6	to	7	6
Gent's bals., kid leg, calf (French), pieced gol.	from	3		6	
Gent's calf Derby bals. ... ... from	3	6	to	5	6
Navvy water-tights, kip				5	6
Gent's elastic, goloshed	3	0	,,	5	6
,, ,, military, French calf ...	6	0	,,	7	0
,, ,, ,, kip	3	6	,,	5	6
,, kid button, French calf, gol., etc.	5	0	,,	8	0
,, calf Oxfords (caps 6d. extra) ...	3	0	,,	4	3
,, kip ,, ...				2	6
Women's all calf kid button, worked holes, 7 buttons				4	6
Women's all calf kid button, worked holes, 9 buttons				5	6
Women's all calf kid button, worked holes, 11 buttons	6	6	,,	7	6
Women's lace, same height, about 4d. and 6d. less than button					
Women's Oxford shoes, lace and button	2	6	,,	4	6

Selection of Leather for the Bottoms.—The stuff for the bottoms of a pair of boots or shoes, called a set of stuff, consists of insoles, outward soles, welts, stiffeners, lifting—according to height of heel*—top pieces, shank pieces, side linings, and felt.

The cost of a medium-sized gent's "set" should be somewhat as follows:—The insoles, cut from shoulder, 5d.; outer soles—a pair of long soles—1s. 6d. These should be cut from English butt leather, and should not be either very yellow or red, but a pale nut brown—the two former coloured leathers being foreign, the latter English. The English leather should have a very fine epidermis, or grain, it being a thin layer only, while the fibrous tissues of the dermis (the true skin) should be very firm, close, fine, and of a nut brown colour. If gent's soles are cut in one piece they are called squares; whereas ladies' soles are always cut in one piece, and are named springs. Welts consist of a long strip of oil-dressed leather about $\frac{3}{4}$in. wide, and cost—women's, 1d.; gent's, $1\frac{1}{2}$d. and 2d. Other parts are stiffeners, cut from shoulder or middle—3d.; lifting, from first cut of butt leather, three pair, about 6d.; top pieces, which must be the same good and solid butt leather as soles, cost 4d. per pair. Gent's soles are not cut long enough to go right through the heel. We therefore need a piece of sole leather to splice on to them; it need not be very good, and with the side-linings will cost about 3d. The prices quoted must serve only as a guide, for much will depend upon the class of boot or shoe you intend to produce.

The Way to Wet, Flesh, Dry, Buff, and Hammer it.—Get a pan of clean water, and put the insoles, outer soles, stiffeners, lifts, and top pieces in it, letting the water cover them. Cut the welts straight down the centre, first making a mark with a pair of compasses to see that both sides are the same width; tie them up in a knot, and put them in the water. When these are perfectly wet through, they, with the exception of the welts, which have to be used wet, should be laid in a draught—not near a fire—to dry. The insoles require to be dried on the last. They must be marked out to the shape of the last with the sewing-awl (Fig. 3), cut in two, and the grain side buffed or scraped† while wet, and tacked on to the

* The sole, split-lift, 3 lifts, and top piece will make about an inch heel; add one whole lift more for each $\frac{1}{8}$ in. required.

† The buff knife. How to make this will be explained when we have more need for it. A sharp knife held perpendicularly will suffice, or even a piece of broken window-glass.

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bottom of the last with four tacks, as A, A, A, and A, Fig. 2 (see No. 165, page 130), and then the sides should be stretched all round with a pair of pincers, and tacked here and there to keep the leather tight to the bottom of the last till it is nearly dry; this is called blocking the insoles. Let the outer soles dry till they are only just mellow, lightly buff off the grain, and skive the thin layer of flesh or superfluous dressing off the back, and the same with the lifts and top-pieces. Then a lap-iron, or old flat iron without its handle, is wanted, and a shoemaker's hammer. Place the lap-iron on the thighs just above the knees, while seated on a low seat,* with its face upwards; hold the leather on it, grain side downwards, and hammer it all over, commencing from the centre, taking care to let each stroke be even, straight, and firm, and striking with the head of the hammer, so as not to bruise the leather. The lifts, etc., do not want to be hammered so hard as the soles and top pieces. Leather is hammered to make the fibrous tissues more dense, and thus more impervious to damp or water, and to offer more resistance to waste in wear.

To Fit Insoles, Stiffeners, and Side Linings. — When the insoles are nearly dry, carefully take out the tacks from the edge, and with a knife round each up to the shape of the last, save at the waist, where it must be made narrower than the last, as shown at B B, Fig. 4, where we suppose the dotted lines, A A, to be the last; then rub a little soap all over. This is to make the awl work better in making the holes. With a pair of compasses draw a line the whole way round from A, ¼ in. to ⅓ in. wide, and divide the sole into three sections by drawing the two lines C and D. This gives (1) the heel, (2) the waist, and (3) the fore part. This margin you have made should be a little wider at the waist; more so at B B than at the ends, and more particularly on the inside. The smartness of the waist depends upon this sweeping curve.

A boot, like a house, depends upon the foundation, for which reason the leather should be good of its class, and every care exercised to fit it properly. The line referred to should also be wider at E. This is done according to the range and pitch of the last. The more dead the last is in the waist, the more the heel will want under-seating—that is, it will want to be feathered wide and sewn under at E, and feathered narrow and sewn full at F and F, to prevent the heel, when built, from pitching on the breast. This line in its proper shape must be cut through to about one-third of the thickness of the leather, the knife being held perpendicularly. This must be opened with a prick-stitch tool (Fig. 5).* Cut the whole of this narrow strip of leather away: this leaves the feather—which must be of even substance all round the fore part—about two-thirds its original thickness. The waist can be thinner, and tapered towards the edge. The way to hole it is to make a second line from the feather in the same way as from the edge for the feather; then put the sewing-awl (Fig. 3) in at this line, and bring the point of it out on the edge of the feather, as at A A, Fig. 6. This is the transverse section of the insole, and shows the feather, B B. After the insole is fitted carefully, take it off the last, and notice that the edge all round on the grain side is quite sharp; this has to be taken off with a knife, but not too much, or we shall destroy the feather. Sometimes it is sufficient to scrape it, and it can be done by running the knife round while it is on the last. This needs more practice. If this is not done, and the foot is at all hot, it will curl up in wear and hurt the foot.

Fig. 7 shows the shape of the stiffeners. They should be good, and used wet, that they may dry hard. For gent's they should be 1¾ in. high at the back: ladies', 1½ in. The length can be decided by measuring the tops. The dotted lines at A, Fig. 2, show about where they should come to. They must be skived all round on both sides, but not much on the grain side, or the stiffness of the leather will be lost. The leather should be skived or tapered to nil right round the top, but the bottom only to half its own substance; the dark parts of Fig. 7 show where and how it should be skived. The side linings (Fig. 8) can be of almost any kind of upper leather, though calf is best, as it is an oil-dressed leather. The dotted line in Fig. 2 indicates its position in the boot or shoe; the dark parts in Fig. 8—as in the stiffeners and fittings—show where they are to be skived.

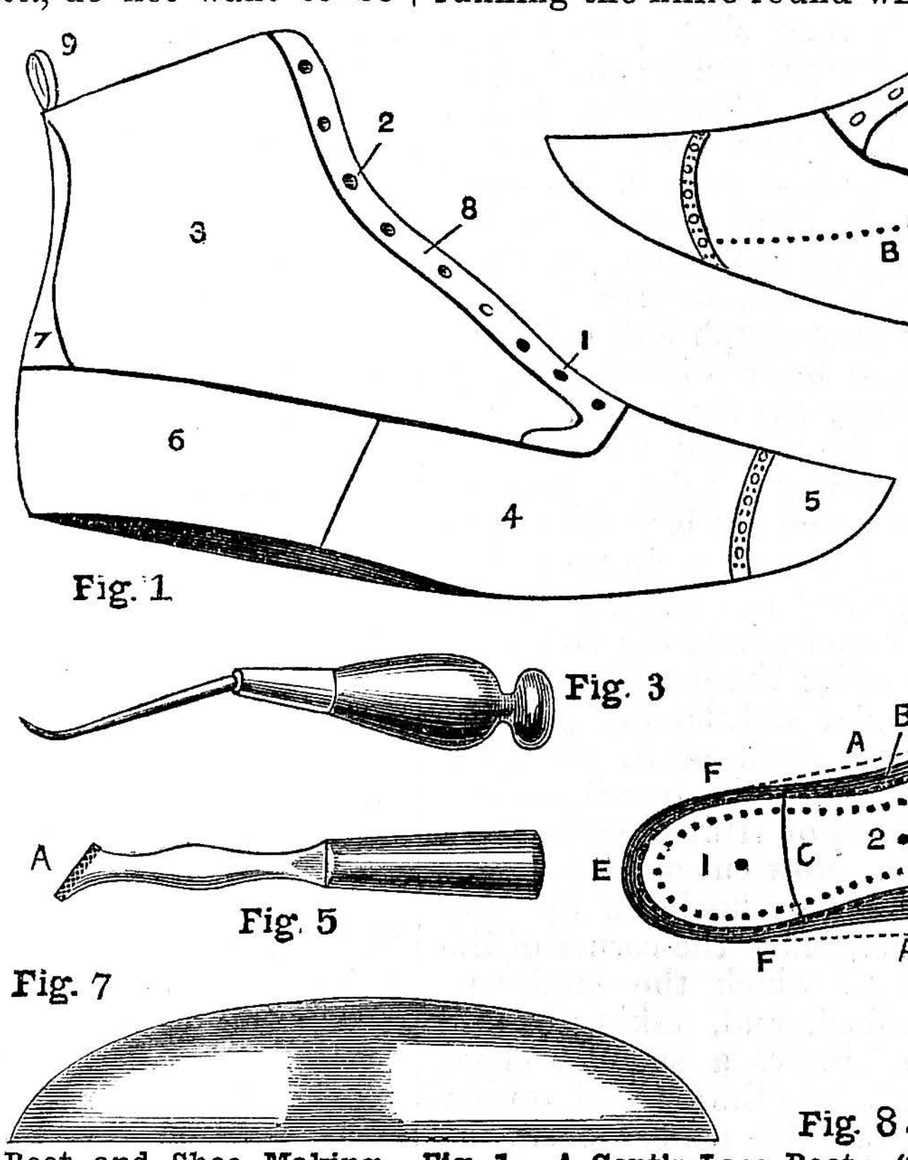

Fig. 1.

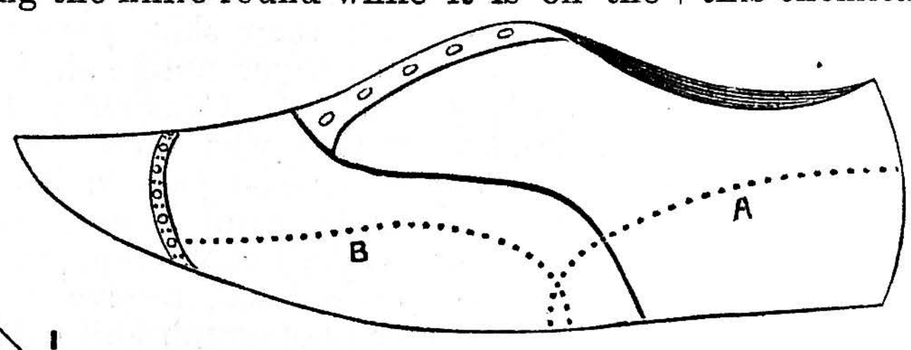

Fig. 2

Fig. 3

Fig. 5

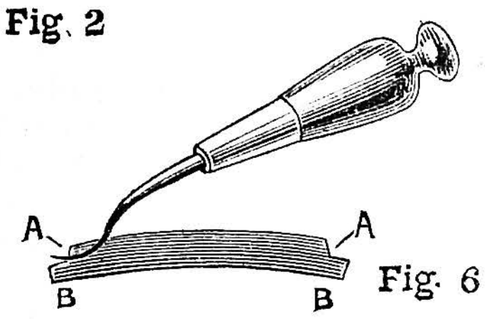

Fig. 6

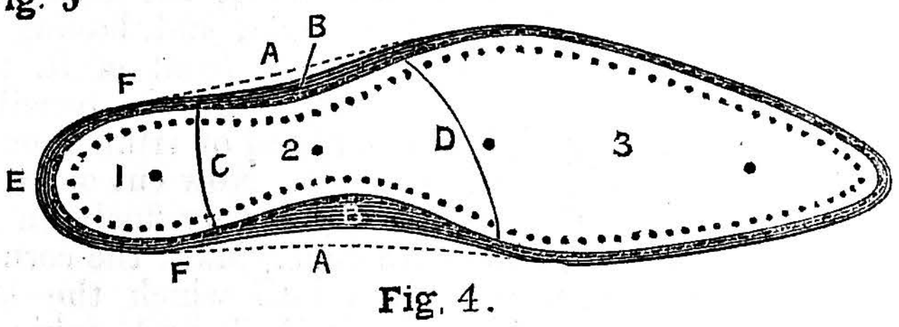

Fig. 4.

Fig. 7

Fig. 8.

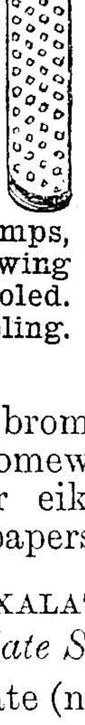
Fig. 9

Boot and Shoe Making. Fig. 1.—A Gent's Lace Boot: (1) Eyelet, (2) Hooks, (3) Quarters, (4) Vamps, (5) Toe-cap, (6) Golosh, (7) Back-straps, (8) Facings, (9) Loop. Fig. 2.—Lace Oxford Shoe, showing position of Stiffener and Side Linings. Fig. 3.—Sewing-awl. Fig. 4.—Inner Sole, fitted and holed. Fig. 5.—Prick-stitch. Fig. 6.—Transverse Section of Inner Sole with Awl in position for holing. Fig. 7.—Stiffener fitted. Fig. 8.—Side Lining fitted. Fig. 9.—Shoemaker's Rasp.

* A stool can be made by cutting four or five inches off the four legs of an old chair.

* This tool is generally made from the handle and shank of an old iron table fork, and sharpened to a blunt edge only, as at A.

PRINTING ON BROMIDE PAPER.

BY G. P.

DEVELOPING SOLUTION—DEVELOPMENT—FIXING—BLISTERS: HOW TO CURE—PRINTING CLOUDS IN BROMIDES—MOUNTING—CONCLUSION.

READERS interested in photography may remember that in WORK, No. 164, I commenced a description of a process of photographic printing under the above heading. I had got as far as "Exposing the Paper," when our "Speaker" called for an adjournment, and I had perforce to obey. Before picking up the connection, I ask my readers to again read my former communication (see WORK, No. 164, p. 114), so that this continuation may be better understood.

Developing Solution. — Bromide paper may be developed with either ferrous oxalate, eikonogen, or hydroquinone, but never with pyro.; indeed, the slightest trace of this chemical in any of the solutions will stain the prints; so be careful. Ferrous oxalate is generally used, although eikonogen is now coming into favour, it being recognised by the highest authorities to be superior to ferrous oxalate. Even Mr. Lyonel Clark admits that "it is most suitable for this class of work, and, in fact, entirely replaces, and is much superior to, either ferrous oxalate or quinol [hydroquinone], the two developers which have hitherto held this place in the dark room." I give here formulæ for both ferrous oxalate and eikonogen developers, so that the reader may choose for himself. My reason for not giving formulæ for a hydroquinone developer is: most of the workers with bromide paper opine that hydroquinone is somewhat inferior to either ferrous oxalate or eikonogen for development of bromide papers.

FERROUS OXALATE DEVELOPER.

Oxalate Solution.

Potassium oxalate (neutral) ...	16 ozs.
Hot water	48 ozs.
Acetic acid	3 drams.

Iron Solution.

Iron protosulphate	16 ozs.
Hot water	32 ozs.
Citric acid	¼ oz.

Bromide Solution.

Potassium bromide	1 oz.
Water	40 ozs.

These solutions to be mixed as follows: For long exposures and light tones: oxalate solution, 12 drams; iron solution, 1 dram; bromide solution, 1 drop. For short exposures and black tones: Oxalate solution, 12 drams; iron solution, 3 drams; bromide solution, 30 drops.

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EIKONOGEN DEVELOPER.

Eikonogen Solution.

Eikonogen	100 grs.
Sodium sulphite*	400 grs.
Citric acid	30 grs.
Boiling water (distilled)	10 ozs.

N.B.—Dissolve the sodium sulphite and citric acid in the water, then add the eikonogen. Be sure the sulphite is dissolved before adding the eikonogen.

Alkali Solution.

Sodium carbonate	400 grs.
Water (distilled) up to	10 ozs.

For ordinary use, take eikonogen solution, 1 oz.; alkali solution, ½ oz.; bromide of potassium, 10 per cent. solution, 1 drop. This may be modified by using more of the "eiko." or more of the alkali, to suit exposure or tones required. Old developer—either eikonogen or ferrous oxalate—renovated just before use with a portion freshly mixed, is considered by some to work more evenly than new, and to give more brilliant prints.

CLEARING SOLUTION.

Acetic acid	2½ drams.
Alum	2½ ozs.
Water	80 ozs.

FIXING SOLUTION.

Sodium hyposulphite ...	15 ozs.
Water	80 ozs.

Development.—After exposure, soak the paper in clean water, and then make up the developer—in the event of ferrous oxalate being used, adding the iron to the oxalate, and not *vice versâ*, or you will come utterly to grief, for a precipitate will be formed. Pour off the water and pour on the developer, rocking the dish steadily. If the paper has been correctly exposed, the image ought to begin to make its appearance in exactly the same number of seconds as the paper was given of exposure. When it appears, and its quality can be judged of, the developer can be modified, if necessary. When nearly far enough out, pour off the developer, and keep a jug of cold water in one hand ready. The moment you see all detail well out, pour a lot of cold water on the print to stop development; a little practice will soon teach you the moment at which to do this. If the picture should flash out too rapidly, pour off the developer at once, and flood the print with water; then add more bromide to the developer, pour off the water, and apply the modified solution. It must be remembered that the *finished print will be darker* than it looks when in the developer; allowance must therefore be made, and the development not carried too far.

Fixing.—After development, and *without washing*, immerse the prints for about two minutes in the clearing solution; pour off this, and repeat. The clearing solution should be prepared freshly for each batch of prints, and should not be stinted in quantity. Now wash the prints thoroughly for about ten minutes in several changes of water, for if all the acid is not removed fading of the prints will result. Now transfer to the fixing bath, which should also be mixed freshly for each batch of prints. Allow fifteen minutes for thorough fixation, then wash thoroughly—say, for two hours in running water or in frequent changes. Place the prints between the leaves of one of "Wheeler's blotting-books" to dry. These books are filled with chemically pure blotting-paper, free from fluff, and are much superior to commercial blotting-paper, which always contains hypo.

Blisters: How to Cure.—Blisters sometimes appear after fixing; they may be avoided by immersing the prints after fixing, and without washing, in a 10 per cent. solution of common salt. If, after fixing and thorough washing, yellow stains should show, immerse the print in chrome alum, 2 ozs.; hydrochloric acid, 1 oz.; water, 30 ozs.; or in a strong solution of tartaric acid, until the stains have disappeared.

Printing Clouds in Bromides. — It is strange that so few photographers, amateur and professional, will take the trouble to print clouds in their landscapes, when these small additions cost so little extra labour and heighten the artistic effect so much. Mr. Ruskin says: "White paper is not the least like air"; and yet more than fifty per cent. of the landscape photographs which we see daily have their skies pure white. Not only is white paper unlike air, but, in the words of Mr. J. Constable, R.A.: "The landscape artist who does not make his skies a very material part in his composition neglects to avail himself of his greatest aids." Let all photographers, then, amateur and professional, resolve now to call no landscape photograph finished until suitable clouds have been printed thereon. To help them to carry out their good intentions, I give here the method for printing clouds in bromide prints. Take a piece of ordinary note-paper, and cut it to the size of the outside opening of your printing frame. Then put the negative into the frame, and press it into one corner; hold the frame up to the light, supporting the negative at the back with the finger, and, having put the note-paper over the front of it, trace the outline of the landscape in pencil on the paper, taking no heed of trifling projections above the sky-line. Now cut out this mask, and snip the edges very finely, in the way vignetters are done. Mark the corner of the printing frame into which the landscape negative was jambed, and, taking it into the "dark room," insert a suitable cloud negative, pushing it into the marked corner, and place on it a bromide paper; close the frame, put the mask on the front, and then expose to the printing lamp for about one-eighth or one-tenth the normal exposure. Return to the "dark room," remove the cloud negative and mask, insert the landscape negative, and again jamb it into the marked corner; place over it the bromide paper, close the frame, and give full normal exposure. Clouds are best printed in subdued light; therefore, increase the distance between your printing frame and lamp, and remember the rule that the time of exposure is quadrupled when the distance is doubled.

Mounting.—The following is the best and cleanest material for mounting bromide or silver prints; and, moreover, it has the advantage of not cockling the mounts, as starch does: Take 4 ozs. of best glue, and break it into small pieces; put into an old jam-pot, and fill up the pot with cold water. Leave the glue to soak until it swells to double its former size and becomes quite flexible, then put the pot into a saucepan with hot water. Boil gently until all the glue is melted, then pour in gradually 4 fluid ozs. of methylated spirits, stirring all the time. Mix well, and strain through muslin into a large bottle for use. When cold, it sets hard, but may be liquefied by placing the bottle containing it in hot water. Shake the bottle. This preparation will keep a long time.

Conclusion.—I sincerely hope that the foregoing may be of use to photographic readers of WORK who have not before tried bromide printing, and also to those who have tried and failed. Difficulties will no doubt be encountered, but no amount of written instruction will make a person proficient in photography without careful practice; therefore, let the reader take trouble to surmount these difficulties, for a certain amount of opposition is a great help to a man. Kites rise against, and not with, the wind: no man ever worked his passage anywhere in a dead calm. Let no reader of WORK give people an opportunity of placing him in the category of "dabblers," but let all remember the words of Mr. T. Delft: "The dabbler, lacking perseverance, patience, and intelligence, flies from one process to another, and, failing in each, is always eager for something new, every new thing sharing the fate of its predecessor. The devotee holds fast to that which is good, and adopts no change but such as leads him a step onward."

Although I have tried to give all the necessary information regarding bromide printing, it is probable that I "in proving foresight may be vain," and there may be one or two points I have not touched on; one or two remedies for failures I have not given; for, as Burns says,

"The best-laid schemes o' mice an' men
Gang aft a-gley,"

but I shall be pleased to help anyone who may apply for information through "Shop."

HAND-WORKING OF SPECULA FOR THE NEWTONIAN TELESCOPE.

BY EDWARD A. FRANCIS.

GLASS—EDGING THE GLASS DISCS—THE CURVE-GAUGE—SAND AND COARSE EMERY—FLOUR-EMERY—THE PROCESS OF ELUTRIATION—ROUGE AND PITCH.

THE following material must be provided before work can be commenced:—

(*a*) Two discs of polished plate glass.

(*b*) A curve-gauge to indicate when the glass has been made sufficiently concave.

(*c*) Sand or grain-emery for rough grinding.

(*d*) Flour-emery of various grades for fine grinding.

(*e*) Rouge (peroxide of iron).

(*f*) Pitch.

These shall be separately considered.

(*a*) *Glass.*—The definite instructions in these notes will apply to the making of a speculum 5½ in. in diameter, and 5 ft. in focal length. The principle of construction, however, applies to specula either larger or smaller, and there is no reason why either the diameter or the focal length mentioned should be adopted. Anyone who is prepared to face extra difficulty may reduce the focal length, even to 3 ft., and thus save trouble in mounting. A speculum of large diameter is scarcely to be recommended for a first experiment.

Two discs of polished plate glass, each 5½ in. in diameter and 1 in. in thickness, should be obtained. The discs will be supplied by the glass merchant with the edges either rough or ground smooth, as may be ordered. The price with rough edges should not exceed 1s. 6d. for each disc, and the further charge for smoothing the edges would probably be a like amount.

If the glass be purchased with the edges rough, they may be smoothed on a large grindstone, using much water and more patience, or they may be mounted in the

* The largest crystals are the best. Keep it in a tightly-stoppered bottle, for if kept long in contact with air it will turn into sul*phate*—an inert, if not a deleterious, compound in the developer.

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lathe and cut true with emery. The last method is, of course, more workmanlike. A disc of wood is cemented to each face of the glass, which is thus mounted. A strip of soft sheet iron, bent as in Fig. 9, is secured to the slide-rest so as to spring against the revolving glass. The lathe is then driven at slow speed, and grain-emery (or quartzose sand) and water is fed down in the direction of the arrows, until, by abrasion, the glass is reduced to shape. Flour-emery is then used for a short time, until a suitably smooth surface appears. The coarse emery may be received in a saucer placed on the bed of the lathe, and so used again and again. The time necessary to edge a 5½ in. disc is about three hours. The bearings and exposed parts of the lathe must, of course, be shielded from any emery which may be thrown off by the rotation of the glass. It is desirable, in order to avoid the risk of grains of coarse emery lodging in the interstices of the jagged edge of the disc intended for the tool, that this also should have its edge smoothed.

(*b*) *The Curve-Gauge.*—The focal length of a concave speculum for parallel light rays (as in a telescope) is one-half the radius of its curvature. At present we shall simply act on this rule: the reason of it will be afterwards considered.

As the speculum with which we are dealing is to be of 5 ft. focal length, the radius of its curvature must be 10 ft. Take a lath of more than 10 ft. in length, and so fix it by one end that the other end may swing free (as in Fig. 10). Ten feet distant from the pivot, A, insert a sharp-pointed tool, capable of cutting through the plate of sheet zinc or copper, C C. The cutting will be performed by repeatedly moving the rod to and fro. When the sheet of metal is cut through it will form two templates or curve-gauges, the one convex, the other concave, the curved edges of which should be smoothed to fit perfectly, and the straight edge turned back, as in Fig. 11, to secure rigidity. If it be inconvenient to swing the radius bar on a wall, the curves may be cut on a level floor.

(*c*) *Sand and Grain-Emery.*—Either of these agents may be used for the first roughing out. Sand (ordinary silver sand) is less expensive than emery, and it may be obtained from any good-natured marble or granite worker. But it loses its cutting power more quickly than emery.

The coarse emery is sold, and is named, according to the number of meshes in each square inch of the sieve through which it has passed in manufacture. Forty, sixty, and ninety hole emeries are suitable for the rough grinding and the first smoothing of the glass.

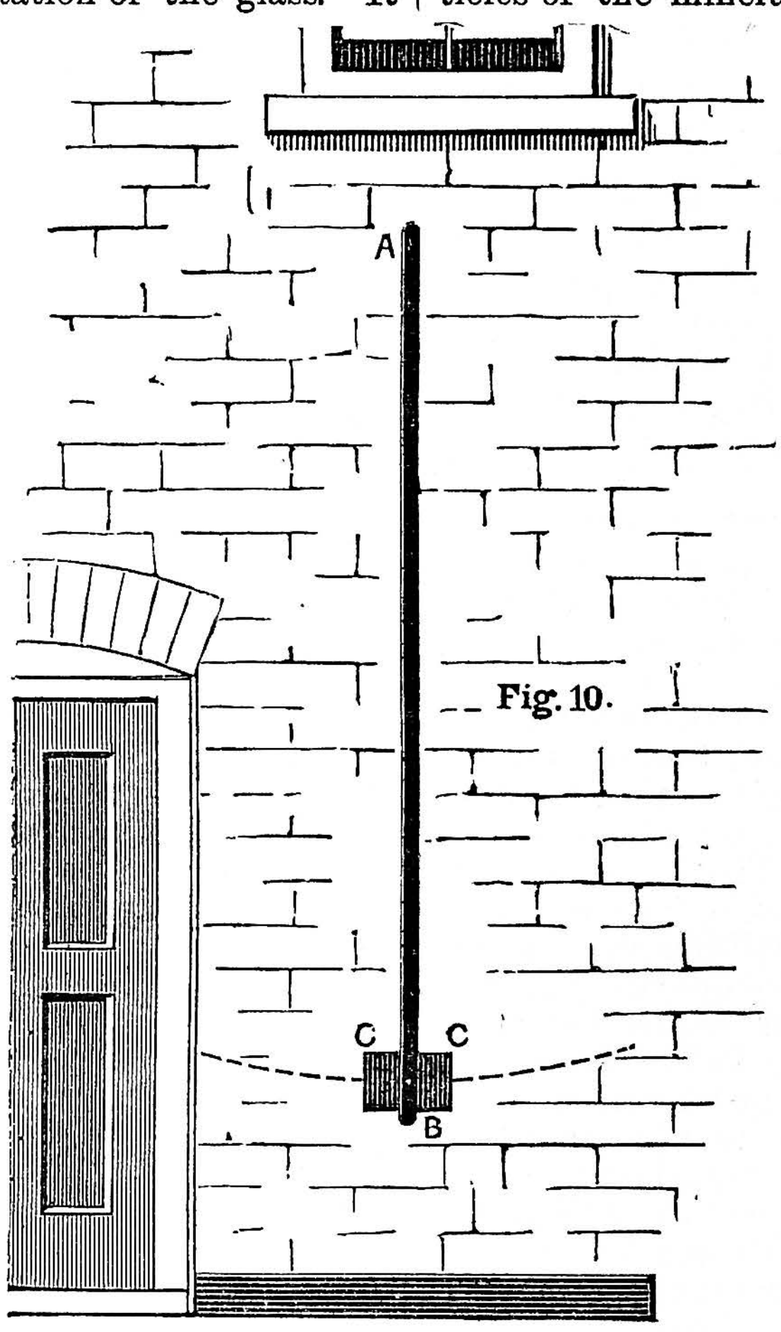


Fig. 10.

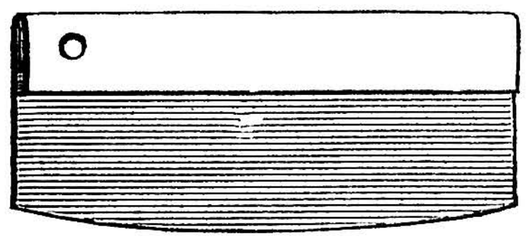
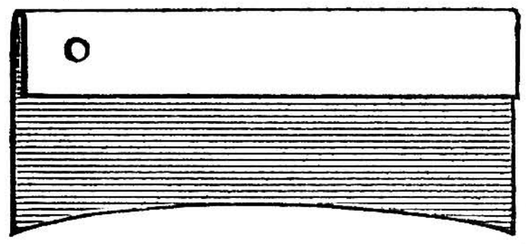


Fig 11.



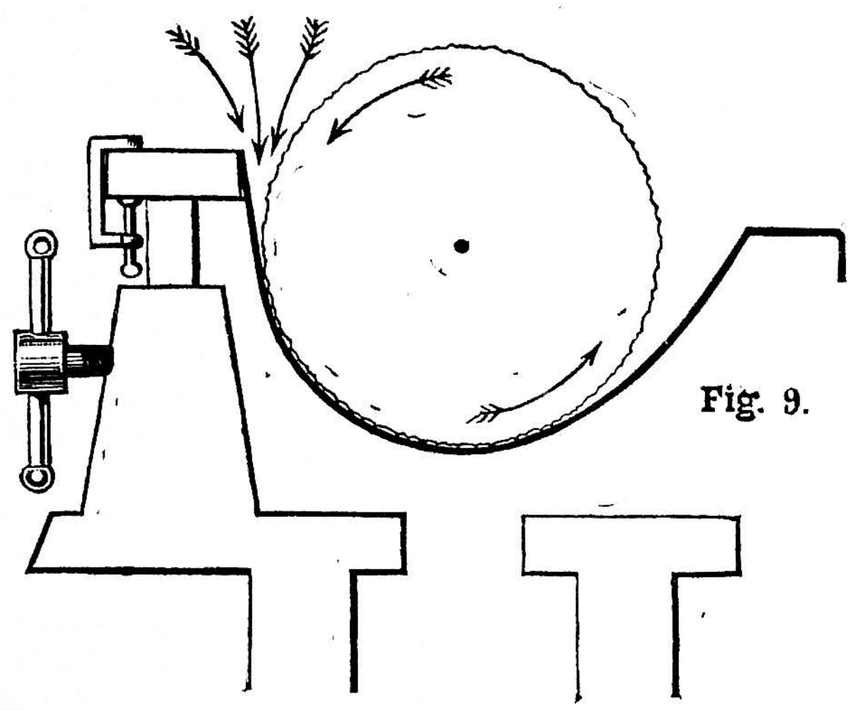


Fig. 9.

Hand-Working of Specula for the Newtonian Telescope. Fig. 9.—Edging a Glass Disc in the Lathe. Fig. 10.—Radius Bar on Wall. Fig. 11.—Metal Curve-Gauges.

(*d*) *Flour-Emery* (elutriated).—For the fine grinding, a much more exact process, flour-emery is used after it has been separated into several grades by the process of elutriation now to be described.

Into a vessel containing about two gallons of water is poured a pound or more of good flour-emery, and the mixture is well stirred. The coarser grains at once sink to the bottom, but a quantity of finer powder remains in suspension. At the end of ten seconds, if the mixture be left entirely undisturbed, all the grains above a certain size will have settled to the bottom. At the end of twenty seconds all the grains of a certain smaller size will have settled down, and so on, until, when half an hour has passed, the greater mass of the emery will have fallen, and only the finest particles of the mineral will remain in suspension, visible as a slight discoloration in the water.

This discoloured water is carefully poured or syphoned into a clean, shallow vessel, and allowed to stand aside, carefully screened from dust, until the impalpable powder which it contains has been precipitated. The quite clean water is then drawn or syphoned off, and the powder which is left adhering to the shallow vessel is dried and collected.

The original mixture being again stirred, and again allowed to subside, the water, charged with powder, is once more drawn off at the end of fifteen minutes, and the powder collected as before, the process being five or six times repeated in some such order as that indicated in the following table:—

Grade *a* collected after 30 minutes' suspension (finest grade)
b " " 15 "
c " " 6 "
d " " 2 "
e " " 1 "
f " " 15 seconds (coarsest grade)

The residue, which will not remain in suspension for fifteen minutes, should be used only for preliminary smoothing.

The table of times, and consequently the degrees of gradation, vary with different opticians. Each intelligent workman formulates a scale of his own. That cited above was used by Tully, of Islington, a famous lens-maker.

Other tables of eminent workmen are:—

Ross,	*a* (finest)	60	minutes'	suspension
	b "	20	"	"
	c "	10	"	"
	d "	2	"	"
	e "	30	seconds'	"
	f (co'rs'st)	10	"	"
Draper,	*a* (finest)	30	minutes'	suspension
	b "	10	"	"
	c "	3	"	"
	d "	1	"	"
	e "	20	seconds'	"
	f (co'rs'st)	3	"	"

It will be observed that the finest powder is necessarily drawn away first, and the coarsest last. In the successive drawings of water the greatest care is needed to prevent any disturbance of the coarser sediment. Of the finer grades a very small quantity will be obtainable (from a pound of flour-emery), and but a very small quantity is required. To complete a 5½ in. speculum, not more of the finest grade will be necessary than could be contained on a sixpenny piece. It is best to use for the elutriation earthenware or glass vessels. The powder adheres to the enamelled surface, and, after drying, can be rubbed with the finger tip into a little heap and collected with ease. Each grade of the washed emery should be kept in a separate labelled bottle or box.

Good flour-emery is of a bright chocolate colour. Powder of a slaty hue is probably adulterated, and should be avoided, as possessing insufficient cutting power. Care bestowed on the process of elutriation is likely to be amply rewarded.

(*e*) *Rouge.*—This is *not* the rouge sold by perfumers, but the peroxide of iron specially prepared, and known commercially (I believe) as "jeweller's rouge." It is of a colour varying from deep red to red with a decided purple tinge, and the latter is the best quality. It needs no preparation, being sent out by the manufacturer ready for use. It should cost from 6s. to 8s. a pound, and an ounce will be sufficient to polish several specula.

(*f*) *Pitch.*—Pitch, which is used as a cement, and to form the polisher, can be purchased, of suitable quality, from the chemist. A box containing a pound or two costs a few pence. When cementing glass to wood, or glass to glass, the surfaces should be always first slightly warmed, that the hot pitch may not be chilled by contact. A question through "Shop" would no doubt be productive of a suitable pitch recipe.

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NOTICE.

"WORK" COMPETITION COUPON
will be found at the foot of page 191.

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BROAD GAUGE.—This is now a matter of history. In the evolution of gauges it must be classed among the unfit. Many elderly men will be able to recall the battle of the gauges that was waged so furiously in the forties. Brunel was the leading railway authority of that period. But time has dealt unkindly with some of the bolder creations of his massive genius. The *Great Eastern* has been broken up after a long record of disaster and financial failure, the Thames Tunnel has lapsed into decent obscurity, and now the gauge for which he fought so many pitched battles before Parliamentary Committees is no more. In this connection it is interesting to note how little *primâ facie* reasons weigh against the slow developments of experience and utility. The 4 ft. 8½ in. gauge, now triumphant, had its origin in the humblest manner possible. It was settled by no conclave of eminent engineers, but, like Topsy, "it growed." It was simply made after that of the first railways in the North of England, whose gauge was that of the old wooden tramways, which they superseded. These tramways had been made to suit the distance between the wheels of the country carts. Brunel could not be otherwise than original and massive in his conceptions, and enjoying the entire confidence of the Great Western Company, he carried his point in the matter of the broad gauge in 1836. He anticipated greater boiler power in the wide engines, with more room for the machinery. He thought that the greater width of base would give increased steadiness and smoothness of motion at high speeds. He also thought that wheels of larger diameter might be used, and the centre of gravity kept low, by placing the bodies of the carriages between the wheels. This latter consideration alone settled the precise width of 7 ft. The running powers of other lines had no weight in early railway days; in fact, the separate gauge was thought an advantage as a means of securing the whole trade of the West of England, South Wales, and the South of Ireland. To show that there was no idea then, in the infancy of the railways, of the growth of traffic, and consequent necessity of uniformity of gauge, the Eastern Counties Railway, it may be noted, was first constructed and opened in 1839 with a gauge of 5 ft. To-day the 4 ft. 8½ in. gauge is employed in Canada, New South Wales, France, North Germany, Holland, Belgium, Austria, Hungary, Turkey, Switzerland, Italy, Sweden, Denmark, Spain, and Peru. During the last year or two, out of over 2,500 miles of English railways, only about 426 have been broad gauge, and of this all but 163 miles have been available also for narrow gauge traffic. Out of 100 trains that have left Paddington and its adjacent goods yards every day, only ten have been broad gauge. Twenty years ago there were more than 700 broad gauge engines running. Recently there have been less than 200. And on May 20, the 10.15 train from Paddington closed the record of over half a century, whose history commenced with the famous "North Star" locomotive in 1839. The change will cost over half a million of money. Fifteen miles of sidings have been laid down at Swindon for the accommodation and conversion of the rolling stock, and 5,000 workmen have been engaged on the alteration of the metals. The Great Western Railway deserves much credit for the thorough manner in which they have effected the change.

"WORK" PRIZE SCHEME.—The present age is essentially a competitive one—so much so, that many minds well able to weigh the matter incline to the conclusion that we are getting altogether too fine an edge upon the national character in this direction. This may or may not be the case. We will not now discuss either the merits or demerits of the question. Taking things as they are, we find that while the great race of life becomes more competitive every week and every day, those concerned do not seem to get tired of it, but go on hourly adding their mite to the great element in motion. Perhaps it is only man's insatiable craving for work which is answerable for this condition of things. If this be so, a comfortable feeling should arise from the contemplation of the superior animal—capable of so much or so little—contentedly and industriously employing himself. Among the directions in which this making of work has been stimulated, none exceeds that arising out of journalistic enterprise, which has been carried to a pitch which almost precludes the most ingenious mind from possibly discovering any new competitive world to conquer. At least, this is how this latter aspect of the matter dawns upon us when, in order to be "up to date," we find ourselves called upon by our readers to afford some sequel to the late WORK Exhibition, which afforded such excellent opportunities for our readers to engage in friendly rivalry. Full particulars of the WORK Prize Scheme will be found set forth in page 190 of this issue. The subject decided upon for the initial competition is an essay upon "The Cycle: Its Worth to the Nation." As there may be two opinions in connection with this text, the competition should elicit some valuable ideas and suggestions, which will be certain to interest the general public. It only remains to add that before the first competition falls out, due notice will be given of the one to follow it. Should the results of these competitions prove satisfactory there is no reason why they should not become permanent. With this view our readers will, no doubt, exert themselves to make the competitions known—especially in cases like the present, when the subject is one surrounded with no restrictions, and open to young and old alike.

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A RUSTIC FLOWER-BASKET OR CENTRE-PIECE FOR LAWN.

BY ARTHUR YORKE.

THE BASKET AND ITS USES—MATERIALS—CONSTRUCTION—FIXING.

The Basket and its Uses.—This rustic receptacle for flowering plants is, as will be seen by the illustrations, a plain octagon in its main portion, but for variety and effect it is so designed that on each of its eight sides a shallower triangular box projects, thus bringing its shape more nearly to that of an eight-pointed star. In size it may be varied to suit any particular lawn, but as here drawn, on a scale of ¾ of an inch to the foot, its dimensions are: height, 5 ft. 6 in., and breadth, 4 ft. 6 in. The internal measurements of the large octagonal box (which stands with its top 3 ft. from the ground) are, from side to side 3 ft., and depth 1 ft. 6 in. This portion is more especially intended for climbing plants, for the support of which a square trellis rises from its centre, and from this there are also flying chains to all the angles. The eight smaller boxes, shaped as right-angled triangles, measure internally 1 ft. at base and 7 in. perpendicular; their depth is 1 ft. They are intended for small, low-growing plants, such as will afford masses of colour.

Materials.—For the bottom of the boxes 1 in. board will be required, and for the sides ¾ in. Elm is considered to endure best for such purposes as this. The four supports may be of any rough and lasting wood that comes most readily to hand; I have drawn them as of larch. The upright sticks which carry the trellis, as well as those at the angles, will perhaps look best in maple or wych-elm, on account of the rough, ornamental bark worn by the saplings of those trees, but larch or other fir will look very well. The rustic mosaic covering the boxes is partly white, made of the halves of peeled withy rods, and partly dark, made of those of hazel, and wearing their natural covering.

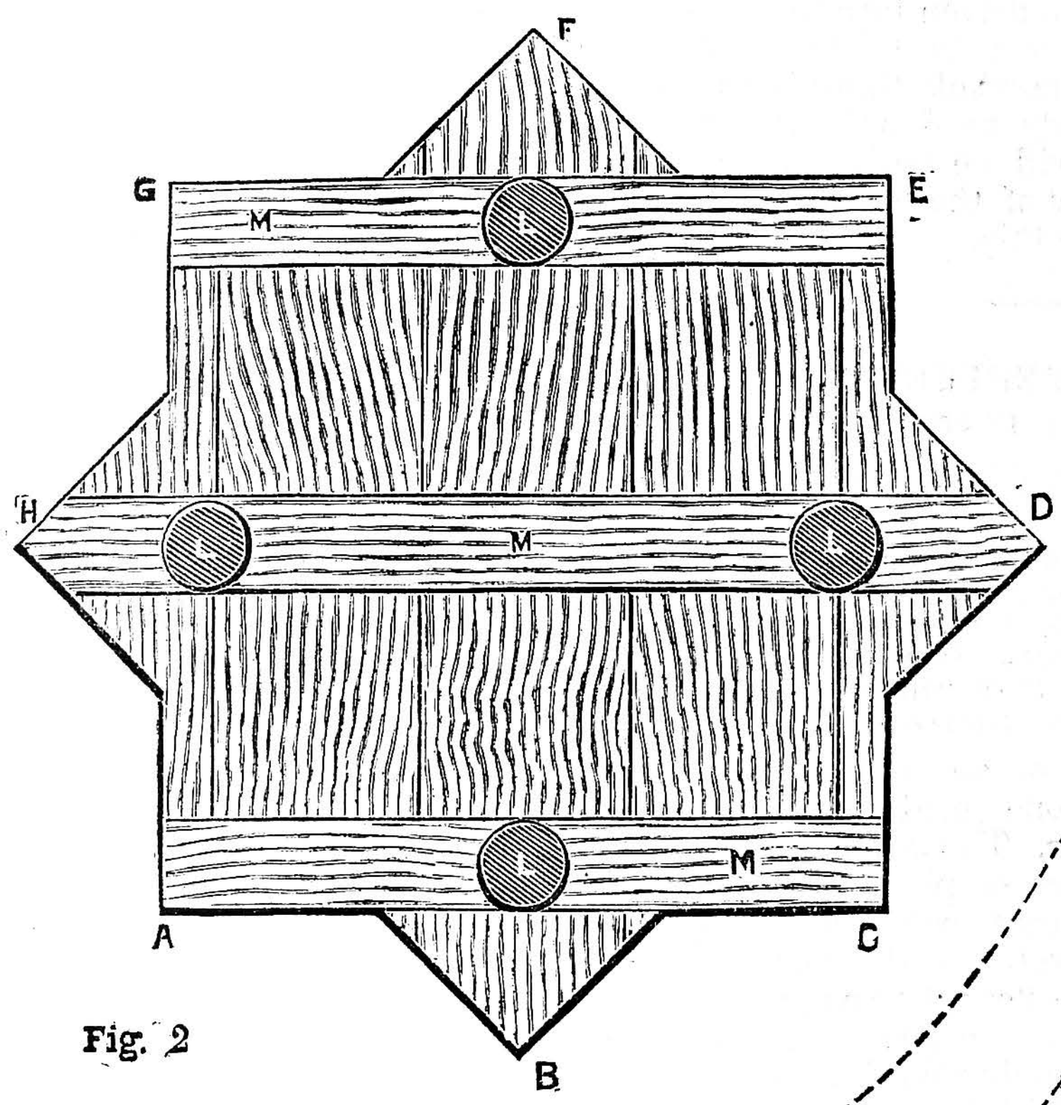

Fig. 2

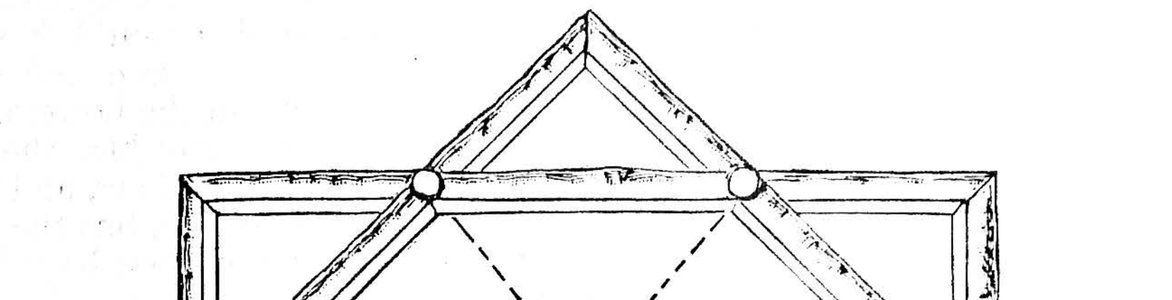

Fig. 4

Fig. 3.

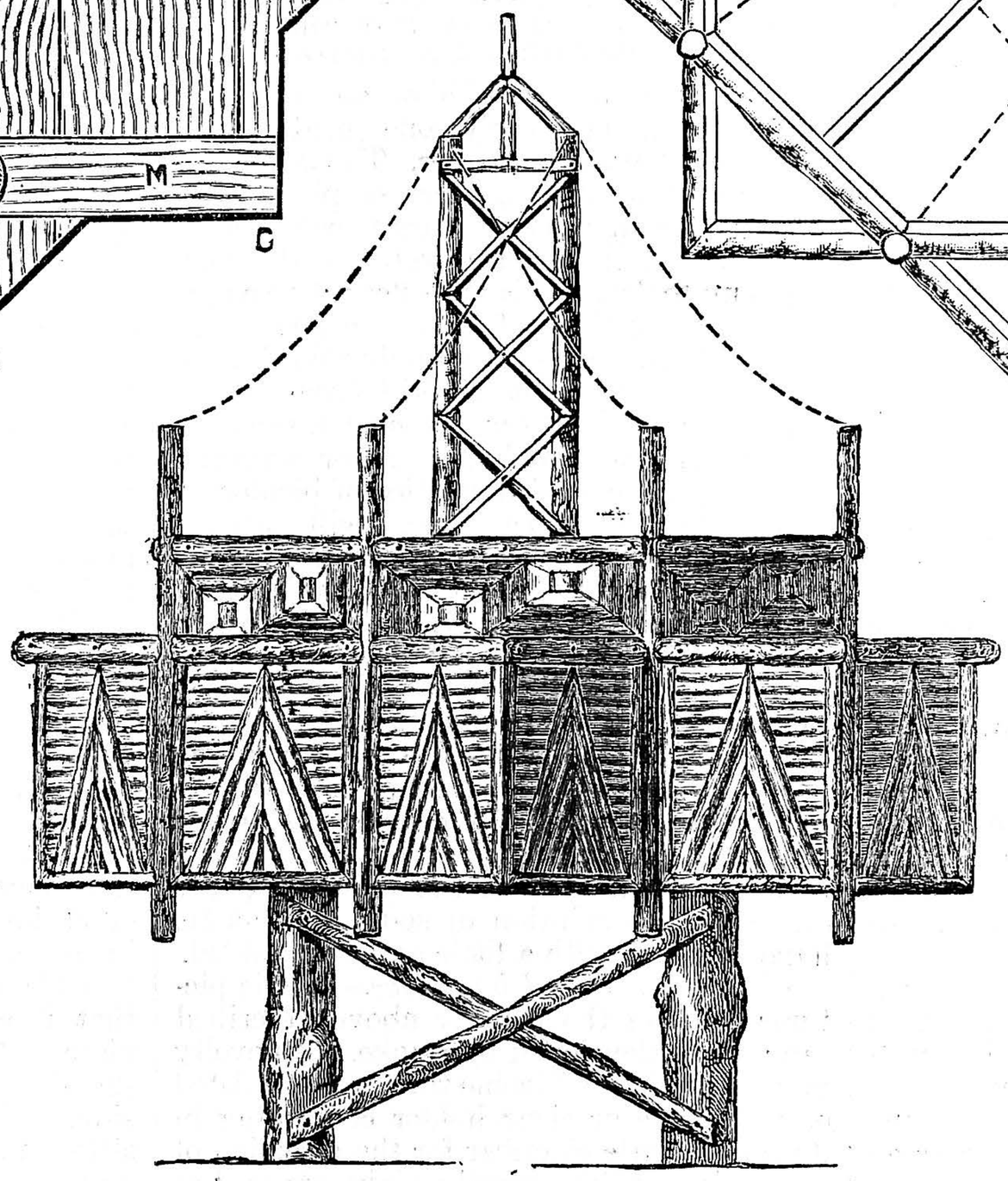

Fig. 1.

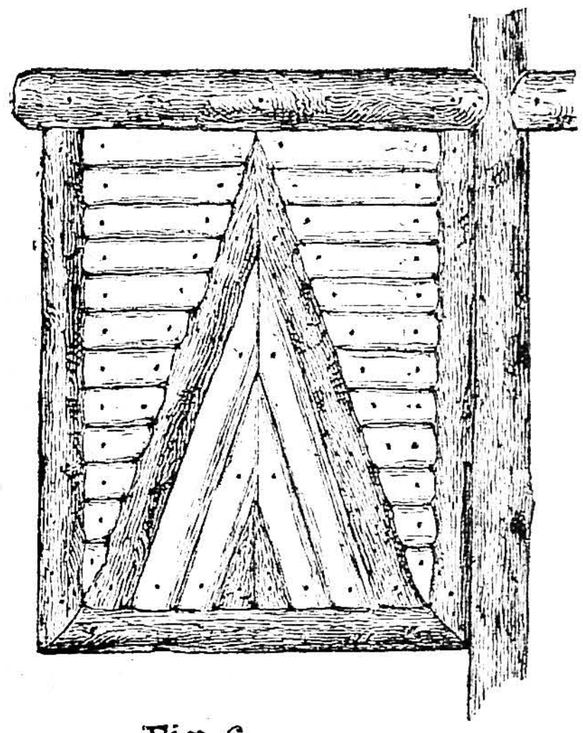

Fig. 6.

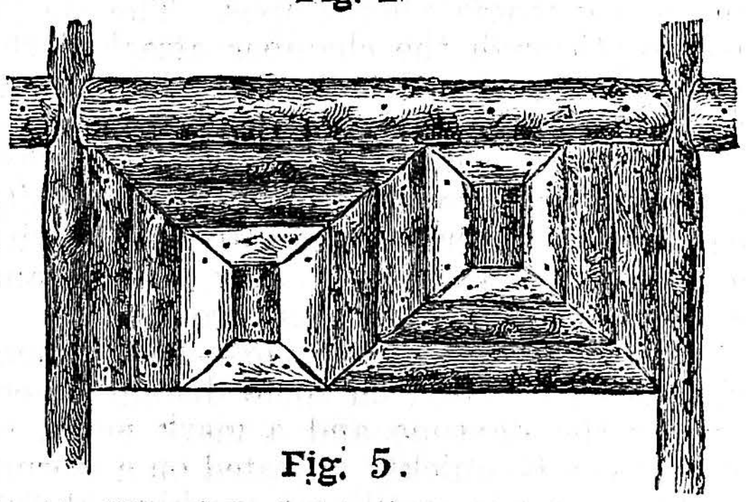

Fig. 5.

Rustic Flower-Basket. Fig. 1.—Elevation of Basket. Fig. 2.—Bottom of Basket, Lower Side. Fig. 3.—Board of Side. Fig. 4.—Plan of Basket, showing its Upper Part. Fig. 5.—Mosaic Border on Octagon. Fig. 6.—Mosaic on Panel.

Construction.—Whether our basket is to be a fixture or removable at pleasure must depend partly on its size and partly on the individual views of its owner. To be sheltered through the winter will doubtless tend to its preservation, but it may suffer damage from careless moving, and it will stand far more firmly as a fixture. Without attempting to decide the question for others, I will for the present presume that it is to be fixed.

Such being the case, the four supports will have to be let into the ground like so many posts. Their position is shown in Fig. 2, where they are marked L, L, L, L. They form a square 18 in. apart; in diameter they should be as much as 4 in. They stand 16 in. above ground, and should go down a foot below.

The bottom of the boxes, made, as before stated, of inch board, is drawn in Fig. 2. It is the underside which there appears,

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and it is nailed together by three ledgers of the same thickness, M, M, M. These ledgers will lie on the supports, and the box will rest on them when in position. In the sides, which are of ¾ in. stuff, it will be obvious that in order to secure the full amount of strength, it will be desirable to make the boards cross each other at the angles. It will be remembered that the sides of the large box have to be boarded to a height of 20 in., and those of the smaller ones to 14 in. We will, for the sake of explanation, say that we begin at bottom with a 9 in. width like that drawn at Fig. 3; it is 3 ft. long, and it has to be nailed to the side A C (Fig. 2). The opening B is cut slanting as shown, to admit the angle B in the same figure. Strips 2 in. wide are also cut from its upper edge as shown at I K. The board for the side G E is precisely the same, and those for G A and E C differ only in being ¾ in. longer at each end. Having placed these, we can board up the intermediate angle boxes, B, D, F, H, with short boards (11 in. long) to the same height as their fellows—viz., 7 in.

If for our second course we again take 9 in. widths, we can cut them the same as for the first course, except that the opening at B will not be required. In this course we nail our first board on the side H B, and so on round the box, thus making the boards cross those already on, and we nail them to the parts of those boards which rise 2 in. above the general level. When this course of boards is nailed on, the angle boxes B, D, F, H, will be boarded up to their required height—viz., 14 in.—and we have to board up the intermediate ones, A, C, E, G, with short lengths of 7 in. wide to make their outer sides also complete.

What now remains to be done is to complete the deeper octagon box, of which the sides A, C, E, G, are at present 16 in. high, whilst the intermediate ones, B, D, F, H, are only 9 in. high. On these last-named we fix another 9 in. width, nailing to the rising corners as before, the pieces being 14 in. long. Next we complete the sides A, C, E, G, with pieces of similar length, 4 in. wide. Lastly, 2 in. strips, filling up the sides B, D, F, H, will complete the box. The short 2 in. strips, of which we have cut a number from the lower boards, we shall utilise as ledgers, nailing them vertically up the inner sides of the boxes.

All this explanation must appear tedious, but I fear that without it many amateur carpenters would be puzzled in dealing with so complex a figure as that before us.

The four uprights which support the trellis are kept in place by strips crossing the box near its top as shown at N N (Fig. 4). The standards are 4 ft. 11 in. long.

Those other uprights which run up the angles of the octagon should be neatly trimmed with the chisel where they come in contact with the boards. Their tops are connected with those of the trellis by what I have called flying chains. These may be real metal chains, or, what will look more in character, we may twist a couple of thin nut rods together, and instead, place them for the climbers to cling to. The arrangement of these things is shown by dotted lines in Fig. 4.

The boarding of the boxes is covered with rustic mosaic—a kind of decoration about which abundant particulars are given in the previous articles on rustic carpentry. The patterns are formed by lengths of split rods bradded to the boards. Of the fret running round the octagon, one of the sides, drawn to double scale (1½ in. to foot), appears in Fig. 5; whilst in Fig. 6, on the same scale, we have one of the panels on the line of the shallower boxes. These sixteen panels are all of like dimensions.

Fixing.—If the basket is to be an absolute fixture, nothing more will be needed than to nail it to the supports, but some may prefer to have the supports fixed and the basket otherwise movable. To do this, iron pins would have to be driven into the supports, and holes for them to fit into bored in the bottom. If the whole thing is to be movable, the supports need only be cut 16 in. long, and they will be nailed to the bottom, but the solidity of the previous plans will not be gained by this.

PHOTOGRAPHIC EXPERIMENTS.

CURIOUS, AMUSING, AND INSTRUCTIVE.

BY WALTER E. WOODBURY.

MAGIC PHOTOGRAPHS—PICTURES PRODUCED BY SMOKE—PHOTOGRAPHING LIGHTNING—REDUCING DARK PRINTS—MAKING A PLASTER CAST FROM A NEGATIVE—ARTIFICIAL SNOW SCENES—DOUBLE PORTRAITS—A TEST FOR HYPO—MAKING A POSITIVE FROM A NEGATIVE.

Magic Photographs.—Take an ordinary silver print, preferably one made upon plain un-albumenised paper. The latter can be made by soaking a piece of plain well-sized paper in a two-per-cent. solution of common salt dissolved in water, and hanging it up to dry. It is then floated on a ten-per-cent. solution of silver nitrate and allowed to dry once again, only this time in the dark. The print should be fixed without toning, and afterwards well washed to remove all traces of hypo. After washing, immerse in a saturated solution of bichloride of mercury, when the image will entirely disappear. Next soak some strong bibulous paper in a saturated solution of sodium sulphite, and, when dry, paste a piece to the back of the print with a little starch paste at the edges only. All that is necessary is to soak the print in water, which dissolves the sulphite and causes it to attack the print and make the image perfectly visible as a brown picture. Of course, the image can also be made to appear by soaking the invisible print, without the bibulous paper attached, in a solution of sodium sulphite, hypo or water with a little ammonia added.

Pictures produced by Smoke.—Magic pictures made in the manner above described can also be developed by smoke. A novelty introduced in Paris some time ago consisted of a cigarette or cigar holder containing in its stem a little chamber for the insertion of small pieces of apparently plain paper, but in reality magic photographs. The smoke passing through the chamber attacked the print and developed the image. By blowing smoke on to the invisible image it may be made to appear, but the operation is rather tedious, and anyone with a little ingenuity can easily construct a cigarette holder with an arrangement to hold tiny prints, and allowing the smoke to pass through it.

Photographing Lightning.—The camera should be focussed on some distant object during the daytime, and a mark made, so that it can be quickly adjusted on a stormy night. A rapid rectilinear working at full aperture is the best for the purpose. Direct the camera to that part of the sky where the lightning most frequently occurs, if possible, so that a portion of the landscape is included on the bottom of the plate. Place a plate in the camera and draw out the slide, uncap the lens, and wait for a flash. If preferred, the cap can be left off, and the images of a number of flashes made; but, of course, the image of one flash is more interesting.

Reducing Dark Prints.—In making a lot of silver prints, it often happens that we find some of them have been printed too darkly. To reduce these to the required depth of colour, adopt the following method. Place the faulty print in a bath made up of six grains of potassium bromide, six grains of mercuric chloride, and one ounce of water, until they are sufficiently reduced in density, when they must be taken out, well washed, and dried.

Making a Plaster Cast from a Negative.—After the negative has been washed, remove it from the water and remove all superfluous moisture with some pieces of blotting-paper. Then gently heat the plate over a lamp or fire, care being taken that it is not made too hot, otherwise the gelatine will melt and run. The effect of a gentle heat is to cause the dark parts of the plate to swell up in high relief, so much so, in fact, that a cast in plaster-of-Paris can easily be made.

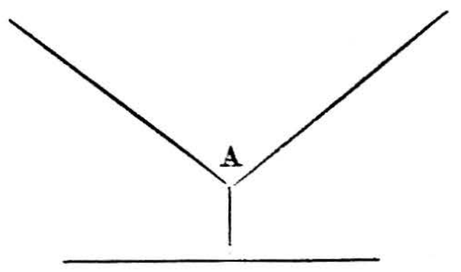
Artificial Snow Scenes.—There are several different ways of producing snowstorm effects with an ordinary landscape negative. The usual plan is to sprinkle a little red colour over the negative by means of a hard brush charged with the colouring matter. But, as a writer points out, the only drawback to this method is that the flakes all appear to have tails. He recommends the following as a better plan. The negative is coated with a thin sticky layer of one part of gum dammar and five parts of ordinary turpentine. A dry colour, like lampblack, for instance, is then placed in a hair sieve, and the latter held at some distance from the negative and shaken until sufficient of the colour has fallen flake-like down upon the negative. When dry, the plate is placed in a printing frame, and a proof made. If satisfactory, the colour is fixed to it by a coating of varnish; if not, the whole can be washed off with turpentine, and the operation repeated.

A hard under-exposed negative gives a good effect, and with a little red colouring matter it can be further improved by touching up parts to represent the fallen snow.

Double Portraits.—These are very effective if made skilfully, there being a number of curious effects that can be produced—for instance, a man playing chess, etc.

A black or red background is required, so that it gives no effect upon the sensitive plate. Place a table in the centre, and let the sitter place himself on a chair on one side. Expose the plate, and then let the sitter take his chair and again seat himself on the other side of the table; another exposure is then made. The slide must be left open the whole time, as any movement of the camera will ruin the picture. If the feet are to be included, it will be necessary to have another red blanket on the ground.

In making a picture of a man shaking hands with himself, a little care must be taken in posing the hands carefully. An invisible rest must be employed. This can be made by a piece of strong black thread tied across the room and fastened in the centre to the floor in this manner—



The hand can then be supported at A.

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A Test for Hypo.—Permanent prints are only possible if every trace of hypo be thoroughly eliminated. To test, take a small quantity of the last water the prints have been washed in, and add a drop of the following solution :—Potassium permanganate, 2 grains; carbonate of potash, 20 grains; distilled water, 40 ounces. If any hypo be present this test solution will turn brown.

Making a Positive from a Negative.—Take an under-exposed negative, one that is, in fact, so under-exposed as to be useless as a negative will answer the purpose well. Thoroughly well wash it, to entirely remove any trace of hypo, and then soak it in a saturated solution of mercuric chloride. This turns the image quite white, and it is then well washed in several changes of water and dried. Afterwards it can be mounted in a frame with a piece of black velvet or cloth behind it, forming a most delicate positive picture resembling a picture on ivory or opal.

CHINESE LACQUER WORK.

THE red gold and pale yellow effects seen in Chinese lacquered cabinets, etc., are produced by the aid of tinfoil laid upon a perfectly smooth surface, and varnished with various gums.

Very effective panels may be made upon this principle, useful for decorative purposes, such as screens, cabinets, etc.

In case sheet metal is used, it should be perfectly free from marks of any kind, and highly polished to begin with. If wood is employed it must be planed very flat and smoothed with fine glass-paper, sized, and primed with white lead and yellow ochre, mixed with drying oil, and a small proportion of oil size; give two coats, rubbing each down with a flat pad, using powdered pumice and water. Next give the work a coat of *flat black*, and rub down, first with finest sand-paper, then with a dry cloth, and finally with the palm of the hand. See that no particle of dust remains, and give an even coat of a mixture of black japan two parts, gold size one part.

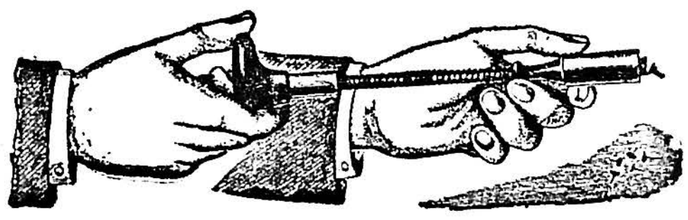
When dry rub down, as above, with pad and pumice, and the panel is ready for the silver leaf.

The portions to be treated with the foil are then given an even coat of gold size, with a small proportion of linseed oil, and when at the proper stage of "tackiness" the leaf or foil is laid on, as in gilding—*e.g.*, if water in a landscape is to be represented, the leaf should be laid on that part exactly; figures, the sun, etc., are treated similarly. When dry, and the surplus leaf removed, the subjects are toned, shaded, and tinted; the darker shades with dragon's blood mixed with turpentine, thinly or thickly as required, the lighter shades with gamboge.

All the *transparent* oil colours, as used by artists, may also be used for various effects upon the foil. The other portions of the landscape, etc., may be executed in oils, and should be more suggestive than in detail. When dry, wash with water and a suspicion of soda, and varnish.

SOME GOOD THINGS.

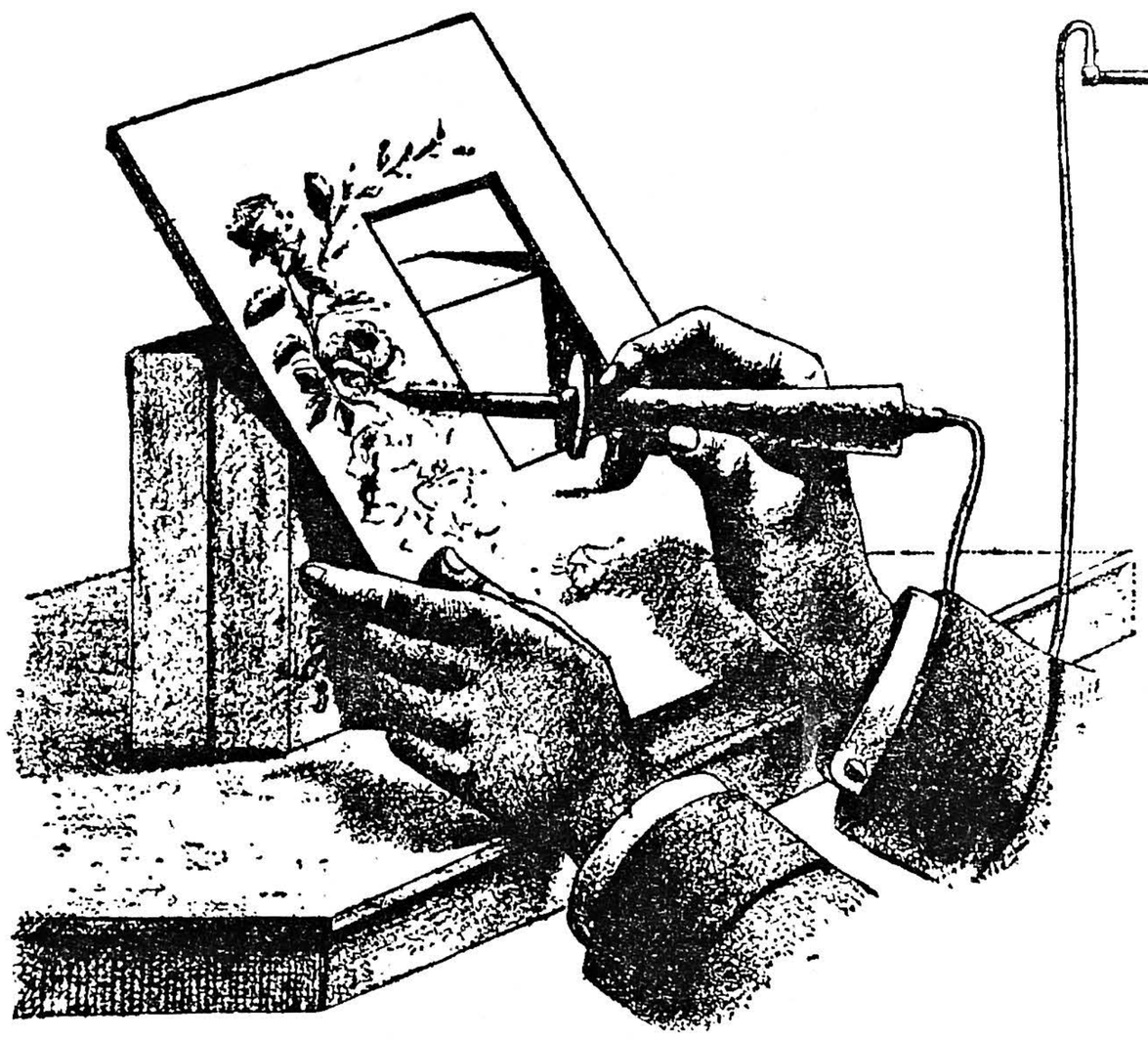
Tin Tack Driver.—So many of our readers have to do with tinned tacks that we have much pleasure in adding our testimony to the worth of Mr. W. Henry Thompson's "Eureka" Magnetic Tinned Tack Driver, an illustration of which is given here. It is simple, strong, and effective; and by its means tacks can be driven in noiselessly and quickly. The Magnetic Tack Driver requires no hammer, and it can be carried in the pocket. It is used by pushing the knob until the magnetised end of the plunger has



Tin Tack Driver.

reached the tack. The pressure is then released, and allows the spring to draw the tack into the brass socket. To drive the tack, the worker places and holds firmly the socket on the wood, hitting the knob with the palm of the hand sharply, when the tack will be found to be properly driven in.

Poker Gas-Etcher.—*À propos* of our articles on Poker Work in Nos. 158 and 163, we present to our readers a design of the Patent Gas-Etcher made by Messrs. Hallam & Scott. The illustration shows how to hold and use the etcher, which may be helpful to workers. The advantages claimed by the present over other machines are as follow:—The left hand is free; there is no further expense after the machine is bought; no danger, no smell, nor dirt; and the pointer is kept at a nice heat, so that very delicate shading can be done; and it is cheap. These advantages should bring it within the reach of amateur workers who wish to decorate woodwork.



Poker Work Gas-Etcher.

"Electric Toy Making." By T. O'Conor Sloane. (E. & F. Spon.)—This little book of 138 pages has a short chapter on primary batteries, and other short chapters on magnetic and electric toys. About 14 pages are devoted to induction coils, 7 pages to dynamos, 13 pages to electro-motors, 5 pages to electric bells, and 11 pages to miscellaneous receipts. The book is well printed and illustrated, but some of the cuts have been borrowed from English journals, although their source is unacknowledged.

SCIENCE TO DATE.

Phosphorescence of Diamonds.—Boyle discovered that diamonds are sometimes phosphorescent. Recently Mr. Kunz, of New York, has stated that all diamonds are susceptible of emitting luminous rays when they are rubbed in the dark with cloth, wood, or metal, after having been exposed to the sun's rays or to the electric light, and that this property may be made use of to distinguish true stones from paste, which does not produce this phenomenon to any degree.

Photographing Rifle Bullets.—Professor Boys has designed an ingenious and simple apparatus for photographing rifle bullets. The bullet is fired through a dark chamber, in which a photographic plate is exposed. In its passage it strikes against two upright wires, thus completing a circuit and producing a brilliant electric spark from a condenser specially arranged so that the spark lasts so short a time that the bullet, although travelling with great velocity, is practically stationary during its existence, and thus a photograph is obtained. Many photographs have thus been taken, and show a wonderful system of air-waves accompanying the bullet in its flight, as well as peculiar eddies of the air in its track.

"Supplementary" Colours.—As white light can be split up into two "complementary" colours, so can coloured light, as Professor Sylvanus Thompson has recently shown, be split up by suitable means into a spectrum tint and a shade of grey. These latter he proposes to call "supplementary" colours. This result agrees with that of Captain Abney, who found that any tint could be matched by mixing grey with a spectrum tint.

Steel Manufacture.—A recent process claims to produce a steel of greater strength by passing an electric current through it whilst in a molten state. It is expected that this will cause the molecules to group themselves in such a manner that, when cold, the steel is more compact and thus strengthened.

Ozone.—Professor Dewar, who in December last discovered that liquid oxygen gas is magnetic, has since proved that liquid ozone is also strongly magnetic.

Action of Nitric Acid on Coal.—If bituminous coal in fine powder be covered with rather more than double its weight of 49 per cent. nitric acid, the mass rapidly becomes warm, and dense red fumes are given off. In this way nearly the whole of the coal is dissolved, and from the product of the reaction a black acid, fairly soluble in distilled water, can be obtained. Its composition is at present unknown, but it seems to be a nitro compound. If this black acid be further treated with nitric acid, a brown acid is formed. Further research may afford valuable information as to the composition of coal.

NOTES FOR WORKERS.

AN exhibition in commemoration of the discovery of America by Columbus is to be held at Genoa, in Italy.

THE carriages to be used on the Liverpool Overhead Railway will be 45 ft. long and 8 ft. 6 in. wide, will run on bogey wheels, and be provided with a gangway from end to end. The weight of a carriage, including the motor, is 14 tons.

AT the Chicago Exhibition there will be about 127,000 electric lamps, of which 7,000 will be arc, of 2,000 candle-power each, and 120,000 incandescent, of 16 candle-power each. To run the plant 22,000 horse-power will be required. In the great manufacturing building alone there will be 33,000 lights.

A PNEUMATIC inner sole for boots has been invented for people with tender feet. It is made of hollow indiarubber, and inflated with air.

A COMMITTEE has been formed, consisting of engineers and electricians, to explain and demonstrate the use of the chief exhibits at the St. Petersburg Electrical Exhibition to the Russian public.

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TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

COTTON TRADE.—All is now going on satisfactorily, trade being good and the mills working full time. Thus both spinners and weavers are doing well. The woollen trade also keeps in a fairly good condition.

CUTLERY AND FILE TRADES.—There is a considerable falling-off in the file trade now that the orders for Spain are completed. Cutlery ware is not in great request, although some individual firms are well employed.

JUTE TRADE.—The depression has now reached Aberdeen, and the Aberdeen Jute Company has been compelled to reduce wages 5 per cent., and to run the mill only four days per week.

CYCLE TRADE.—The cycle trade is growing apace in the Midlands. Coventry, formerly foremost in watch making and silk ribbon weaving, now claims cycle making as its staple trade. Redditch, the centre of the needle industry, is also taking up cycle making. Many of the large engineering firms of Birmingham and other towns are forming a cycle department, workmen being advertised for on all sides. Our Glasgow correspondent writes:—The season is now in full swing, and agents in most places have a splendid run of trade.

TIMBER TRADE.—The deliveries from the London docks still show a decrease. The hardwood and mahogany trade seems to be rather brisk, although there is little or nothing doing in teak. The last of the mahogany cargoes have arrived, and most have been disposed of. At Grimsby, Hull, Hartlepool, and Cardiff the cry is "Prices dull and demand moderate." Floorings and matchings showed a falling-off in prices at the London sales, and other goods went little better—in fact, some must have been sold at under cost price. At Liverpool there have been large auction sales of logs, etc., including pitch pine, pencil cedar, mahogany, American hardwood, oak, black walnut, and hickory. Ebony: 10 tons from Elobey sold at £6, and 30 tons Gaboon at £6 7s. 6d., per ton ex-quay.

CABINET TRADE.—Cabinet makers and French polishers are fully employed in Birmingham.

ENGINEERING TRADE.—Although no very material improvement can be reported in the condition of the engineering and iron industries of the Manchester district, some of the local establishments are booking a few orders; but, generally speaking, there is a conspicuous absence of new work, especially in the machine tool and stationary engine branches. The business of the boiler makers has taken a turn for the better, and many firms have now enough work in hand to keep them fairly busy for some weeks to come. Locomotive builders and the various machinists report no change in the aspect of trade, and generally the tendency is still towards increasing slackness. Barrow is the only centre where trade continues in a flourishing condition. Here both engineers and shipbuilders are exceedingly busy, and, from the orders lately secured, it would seem that this activity will continue at least to the end of the year. The condition of the shipbuilding and marine engineering trades on the Mersey is becoming, if anything, more serious than ever. No new work of any kind has been booked for some time, and, except for an occasional renewal of boilers and other repairs, the shops are virtually at a standstill, while the yards are only employed in finishing vessels now on the stocks. No appreciable improvement takes place in the state of the iron market, buyers being disposed to pursue the hand-to-mouth policy which has been observed of late. In the metal market quietness is still reported, buyers—who are, for the most part, short of work—holding back in anticipation of lower rates prevailing in manufactured materials, but at present there is little prospect of a lowering of prices taking place.

METAL AND CHEMICAL TRADES.—Our Liverpool correspondent writes:—Reports are to hand that there is an improvement both in the metal and chemical markets. Most of the metals are dearer, and chemicals are scarcer. There is an increasing demand for bleaching powder.

MASONRY TRADE.—It has been decided by the arbitrator for the Liverpool stone-masons that the wages be 9d. instead of 8½d. per hour, which the men demanded; also that payment of wages commence not later than 12·15 on Saturdays.

RUBBER TRADE.—A considerable quantity of rubber has lately been sold by auction in Liverpool (60 tons, besides 261 casks and packages of no stated weight). The present prices are: Para, 2s. 10d. per lb.; Cape Coast and Acera, 1s. 2d.; Gambier niggars, 1s. 5½d. to 1s. 10½d.; Grand Bassam, 1s. 4d.; Sierra Leone, 1s. 2d. to 1s. 6½d.; ordinary South Coast Flake, 11d. per lb.

SILVER AND ELECTRO TRADES.—There is a further improvement in the Sheffield silver, electro-plated, and Britannia metal trades, orders coming in freely for trophies for summer sports.

COAL TRADE.—In the West Yorkshire coal trade business does not compare favourably with the volume of trade in 1891. Best Haigh Moor, 13s.; seconds, 12s.; Silkstone hards, 12s.; house coal and cobs, 11s. 6d.; Stanley Main seconds, 8s. 9d.; steam coal, 8s. 9d.; coke, 8s. 6d.; slack, 5s. to 6s.; smudge, 2s. 6d. to 5s.—all per ton.

EDGE TOOL TRADE.—In consequence of the brisk skate trade last winter, the edge tool stocks have got extremely low, therefore the workmen in this trade are busily employed. These two trades go together, as a rule, forming a winter and summer trade; and in the case of a severe winter when skating may be practised, it proves one of the steadiest trades in Sheffield.

HATTERS' TRADE.—Orders in hand are unprecedented; but a strike has occurred at Stockport in consequence of the refusal of the employers to increase the rates of payment and to formally recognise the men's union.

STEEL TRADE.—The Durham strike is still interfering with the manufacture of Bessemer steel. There is a continued scarcity of hematite iron, and prices of Bessemer steel have further advanced; but railway companies are giving out their average amount of railway work, although their traffic returns have of late shown a falling-off.

BUILDING TRADE.—The masons and wallers of Nelson and district have struck work for an advance of wages from 8d. to 8½d. per hour. In Rochdale and district the joiners, bricklayers, plumbers, painters, and all kindred trades are busy. The stone-masons are still on strike, though a good many are employed by the smaller builders at the wages they are standing out for—9d. per hour. In the Elgin district building operations are good. There is some difficulty in finding masons to do the work. So many from the district emigrate to the States that few are left for the work at home. Several important contracts will be let, which will keep builders busy during the summer months.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.*

I.—LETTERS FROM CORRESPONDENTS.

Russian Larch.—A. R. (*Scorrier*) writes:—"It may interest our readers to know that Russian larch timber is superior to teak or oak to a great extent for ship-building. Many of our war ships and other iron ships are lined with teak, which is reputed not to decay; but the fact is it does decay. It is subject to destruction by a species of worms. Larch timber answers much better for ship-building purposes. It does not become worm eaten, nor, on account of its resinous properties, does it so easily decay. If exposed to the air or to water it becomes almost as hard as iron. Ships have been built almost exclusively of larch, oak only being used in the curved parts of the vessel. The iron bolts have been found to rust more rapidly in the oak owing to the tannic acid it contains."

Machinery Photos.—T. R. B. (*Newcastle-on-Tyne*) writes:—"Many are in the habit of photographing machinery for the purpose of sending the photograph to a possible buyer. To such the following hint may not be lost: Say, for example, a full front view of a drilling machine is to be taken. Lay a piece of board 2 ft. long by 3 in. in width on the ground in front of the machine, and close up to it; then take the photo. Now we have a photo. of the machine, and to *scale*. Mention the size of the wood to the customer, and he will be able to make all necessary measurements to ascertain whether the machine will suit him or not."

A Teacher's Guild.—H.B.S.(*Liverpool*) writes:—"I noticed a leaderette the other week in WORK about 'Workmen's Holidays'; could we not inaugurate something like a teacher's guild for the purpose of having excursions to places of interest, and to urge upon the railway companies the desirability of cheap rates for workmen who are wanting a holiday, and who cannot, at the present rates, afford one? The institution might be called the 'Workmen's Guild.' It would require the workmen to go into it heart and soul to make it succeed."—[We give insertion to this suggestion. It is for our readers themselves to determine the value of the idea and to follow it up.—ED.]

Needed Inventions.—E. B. (*Manchester*) writes:—"You said a few weeks ago that you would be pleased for any suggestions for needed inventions. Well, an invention is badly needed for a machine for peeling potatoes and apples without cutting to waste. There have been several machines, but they do not do the work satisfactorily, as by hand. Any new machine must adapt itself to irregular shapes."

Testing Accuracy of Framework.—G. P. (*Elgin*) writes, in reply to J. C. K. (*London, N.W.*) (see WORK, No. 161, page 76):—"With curious persistency which I am unable to account for, J. C. K., notwithstanding my former remarks, repeats: 'Assuming true square of angles and lengths of sides of frame, where and why the necessity for testing?' I reply, None whatever. It is simply because we *cannot* assume true square of angles that we require to test; but I hold that if the opposite sides of the frame be equal, and if the diagonals be equal (I say nothing whatever about angles), *then* the angles are bound to be right angles; and I shall continue to hold that opinion until J. C. K. proves that we who hold it are wrong. A case is cited of the test clumsily applied, but if the simple measuring and comparing two short distances be too much for a man, one may imagine his confusion when set to test the accuracy of a framework (say the carcase of a dresser) by means of a square. When learning geometry, the definition of a trapezoid given me was: 'A trapezoid is a quadrilateral having two of its sides parallel and the other two not parallel.' Now I can easily imagine such a figure, indeed, I have one before me, in which one of the non-parallel sides is perpendicular to each of the parallel sides, while the other non-parallel side makes an obtuse angle with one parallel side and an acute angle with the other; and I cannot, try how I will, make the figure such that the opposite sides shall be equal. I congratulate J. C. K. on the closing sentence of his communication, and I heartily reciprocate his sentiment."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Copal Varnish.—J. R. E. (*Congo Balolo Mission, Upper Congo*).—I much regret that I am unable to give you any reliable formulæ or method by which you can convert the copal gum in your midst into a serviceable varnish. Copal varnish making is for the expert and experienced only. It is not, as so many readers of WORK appear to fancy, merely a question of mixing by heat certain articles in a vessel for a certain time. I should say you would do far better to import the varnish you want, and to export the copal gum—which latter is a valuable commodity. I have replied to so many queries in "Shop" upon this subject that I am almost ashamed to send this to the Editor. I have an illustrated description of the works and processes used in varnish-making by a very eminent London firm; but it is useless to think any part, or the whole of such, would aid the raw novice in concocting small quantities. There are no recipes in any book yet published that I could recommend you to try; and I have it direct from one of the first English manufacturing firms that all the information yet printed on copal varnish-making is but "trash."—F. P.

Bevelling Tires.—G. W. (*Bournemouth*).—I do not know of any machine for bevelling wheel tires; 4½ in. and 6 in. tyres bevelled have gone out of date altogether. The outside of a 4½ in. or 6 in. is now made convex. Light cart and carriage tires are bent out of straight flat bars in the bending-machine. There is also a jumping-machine to assist in piecing tires and axles.—W. P.

Fireproof Safes.—A CONSTANT READER (*Mile End*).—Our correspondent has evidently got hold of one of the "sheet metal boxes" (Brummagem duffer"), sold as, and miscalled, "Fireproof Safes," with which the market is flooded. We have seen dozens of this kind of ware, and found the "fireproofing composition," as a rule, to be of the character named. The object of placing a material between the inner and outer cases was to cause the heat to melt and vaporise the same, so as to produce moisture in the interior, and thus reduce the damage caused by the fire and heat to the papers therein contained. Each maker of *safes*—we mean the respectable ones—has a composition of his own, which is generally looked upon as a trade secret. Our correspondent should refer, in the Patent Office Library, to the Abridgments of "Safes and Strong Rooms," where he will find specified the various materials used by most of the makers of safes. From these he will be able to select that best suited to his purpose.—C. E.

Lenses.—W. H. (*Chorley*).—Achromatic lenses were, and are, sometimes made triple. That which you have is probably of old manufacture, but is not likely to be the worse therefore. Your Huyghenian eye-piece is apparently properly made. To ascertain its magnifying power, take half the focal length of the larger lens of the eye-piece, and divide it into the focal length of the object-glass, thus:

Focal length of field lens of eye-piece = ¾ in.
" " " object-glass .. .. = 24
∴ magnifying power = $\frac{24}{\frac{1}{2} \text{ of } \frac{3}{4}} = 64$

—E. A. F.

Fountain.—W. J. (*King's Cross*).—So many readers of WORK have made up the fountain described in No. 69, and find it work successfully, that it is clear you have not quite carried out every detail. The height to which the jet will play is determined first by the *distance between* the upper and lower vessels (compared with which it must always be less), and by the friction of the outlet and also its shape; and the highest jet is produced with a pipe and jet formed of one continuous tapering passage, without a tap. The reason the water does not rise instantly is because some air gets in the way of the water in the down-pipe and temporarily checks the pressure—a small trouble. Do not mind how many pints of water go down the pipe, but be sure the basin is about half full or more, so that you get the maximum pressure.—C. M. W.

Beehive.—G. W. C. (*West Butterwick*).—You know, I suppose, that the standard frame is 14 in. long by 8½ in. deep. The breadth of a hive in which standard frames are used is 14½ in., thus allowing ¼ of an inch at each end of the frames; and the depth is 8½ in., thus allowing the frame to be from the floor the thickness of the top bar, usually ⅜ in. or ½ in. The frames are 1$\frac{9}{10}$ in. apart, and if we multiply this by 12, which is about 17½ in., we have the inside length of a hive capable of holding twelve frames. Therefore, the internal dimensions of your hive will be 14½ in. × 8½ in. × 17½ in. For the rest, make a box this size, with double walls, roof, and floor-board, and you have a good hive. Read my papers on Hives, etc., which run through the second volume of WORK.—APIS.

Reversing Gear for ¼-Horse Engine.—ERIC.—Are you sure you really wish to go in for this? It would be impossible to give you "lucid" instruction in "Shop." Link motion has more in it than you think, perhaps; besides, engines of this sort rarely have link motion. A locomotive must have it, and so must a crab-winch, but an engine to drive an amateur's shop does not require it. If he wants his lathe to reverse, he uses two loose pulleys and an open and crossed belt; he can't well leave his lathe and run to the engine when he wants to stop, start, or reverse. If you require to reverse *occasionally* for a short time, that would not hurt the guide-bars, and you could use a slip eccentric, which would turn half-way round on the shaft.—F. A. M.

Procuring Papier-Mâché. — S. B. C. (*Liverpool*).—Try McCallum & Hodson, Summer Row, Birmingham. To procure an equal strength, you will certainly require a greater thickness in papier-mâché than in tin-plate.—S. W.

WORK Subjects.—H. P. (*Langley*).—All the subjects you indicate shall be duly considered.

Boys' Golf Balls.—J. W. H. (*Edinburgh*).—For golf tools, apply to Slazenger, 56, Cannon Street, London, or McEwan & Son, Chingford.—J. W. H.

Boxwood Modelling Tools.—J. A. (*Birmingham*).—Lechertier Barbe, Regent Street, London, supply boxwood modelling tools at moderate prices; also G. Philip & Sons, Fleet Street, London, sell them.—W. E. R.

Cylinder.—INNEK.—No; not without making a new portion, and soldering or screwing on. Better to have a fresh casting.—J.

Temper Bits. — R. F. (*Norwich*). —See my articles, entitled "Practical Papers for Smiths," in Vol. III. of WORK.—J.

To Strain, Mount, and Varnish Prints, etc.—A. C. C. (*Rochford*). — The linen or calico must first be stretched on a plain strainer (either skeleton or panelled). This should be done by tacking it tightly; then it must be thoroughly coated with strong size, and left till nearly dry. The sheet of paper or print to be mounted must be well covered with carefully made paste—*i.e.*, well stirred paste about as thick as porridge, with a pinch of alum boiled with it, then squeezed and strained through coarse canvas. It is best to paste it twice, leaving the first coat about ten minutes to soak into the paper. After applying the second coat, place the paper on the strained linen, and dab all over with a clean cloth. When thoroughly dry, which process must not be hurried, give two coats of thin size (a piece the size of a small nut in a small cupful of hot water will be strong enough); or if the engraving be anything very choice, size of the same strength as above, but made of gelatine, is better; when dry, varnish with white hard varnish. A plan I have adopted for ornamenting such rooms as nurseries, bedrooms, and "snuggeries," is to take some of those excellent colour reproductions, and sponge the backs with clean water; when half dry, paste *round the edges only* about ¾ of an inch, and lay on the wall, dabbing all round. You will find them dry quite tight and strained. You can then size and varnish them as before directed. They will then last fresh for years, and can be washed at any time with freedom.—F. B.

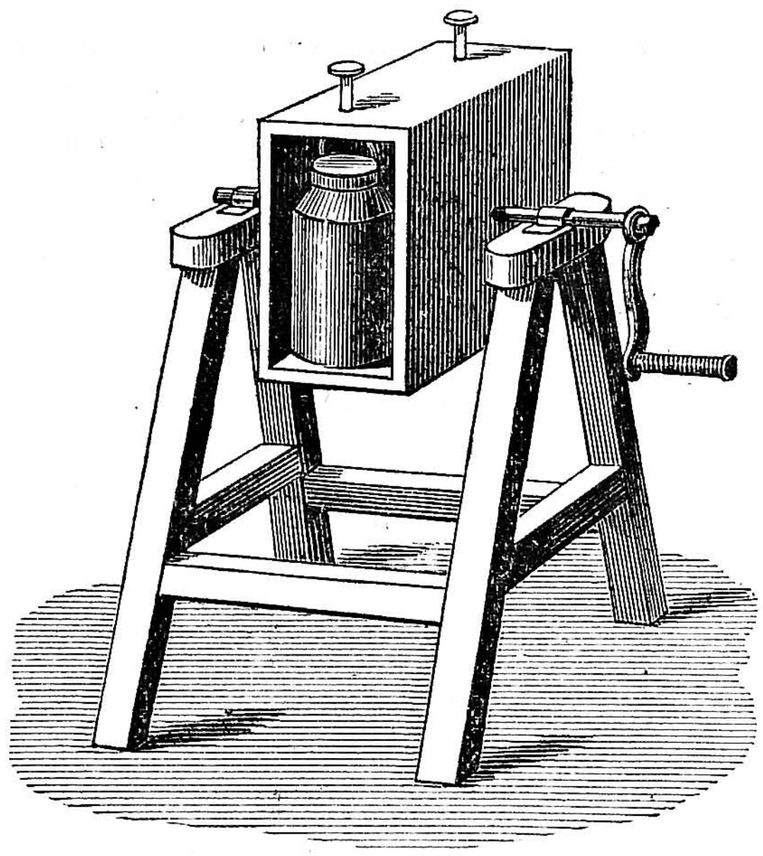
Pigeon Trap.—E. W. (*Chirk Green*).—You had better consult a local man.

Upholstery.—L. (*Pontefract*).—I must frankly confess that I am unable (and I believe no other contributor is able) to give better advice to L. than is given on page 807, Vol. II. I may add that to cover a scroll you had better tack here and there, not driving the tacks home, but altering and regulating as found necessary.—B. A. B.

"Great Eastern" Models and Catalogues.—Our numerous readers who have written as to these, in reply to MODEL S. L.'s query (see page 814, Vol. III.), should advertise in our "Sale and Exchange" column.

Self-Acting Fountain.—A. W. (*Canning Town*).—You should advertise in the "Sale and Exchange" column of WORK.

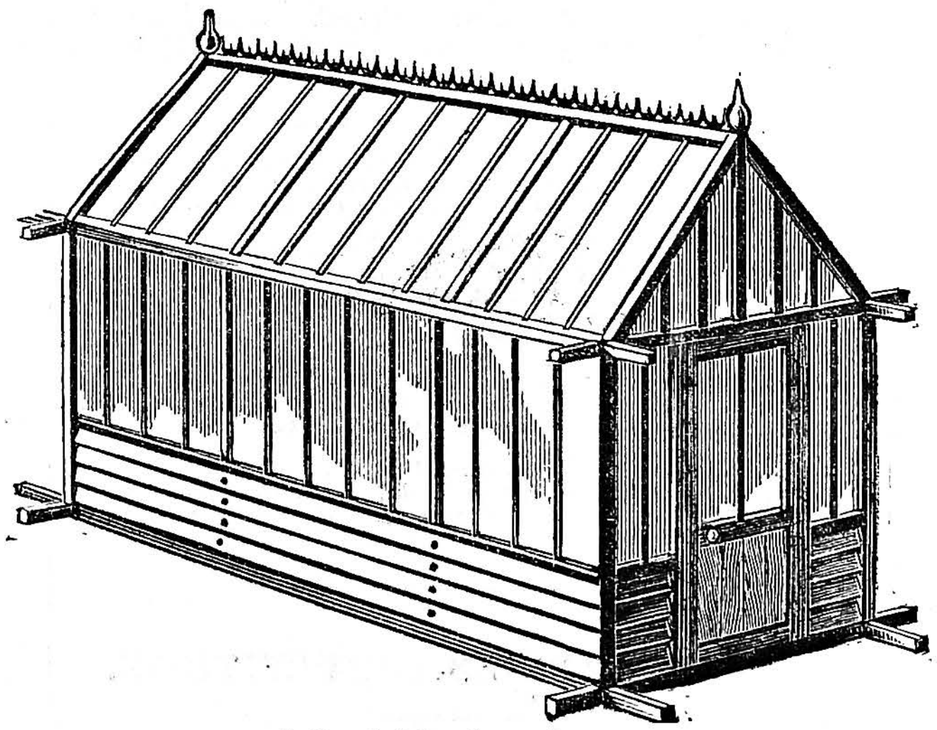
Churn.—W. J. B. (*Deptford*).—If I were going to attempt to make a churn, I should obtain a couple of glass jars as large as possible, with as large necks as can be had. I have seen such jars for French



A Domestic Churn.

plums and confectionery. Also a grindstone spindle, which, with roller bearings, can be had for 3s. in malleable cast iron. A frame must be made to contain the jars, having a screw adjustment to fix them. This fixture must also assist in keeping the cover on the jars. I think, however, that it will be better to buy a churn ready for use. One capable of making 1½ lb. of butter at a churning may be had for a small sum of Kent & Co. I fear the proper jars can only be had by buyers of complete churns.—B. A. B.

Conservatory.—H. B. (*Finsbury Park*).—The probable cost of a greenhouse for tomatoes, 9 ft. × 6 ft. × 6 ft., would be about £2, plus labour, varying, of course, according to materials used. As you require it to be easily removable, I should recommend you to make the base-frame like a large "Oxford frame"—a form which is capable of bearing a great strain. The ends of the cross-pieces



A Portable Greenhouse.

should project about three inches; the same remark also applies to the top frame. The uprights should be tenoned into the centres of the cross-corners, and into the side lengths where required, say 3 ft. apart on the 9 ft. side, using also two uprights at each end for doorposts; 2 in. deal would be a suitable strength for the entire frame except the ridge board, which should be about 4 in. wide by ¾ in., fixed edgewise. Do not use any other form, as this is the best to avoid sagging in the ridge. The joints must be tenoned true and neatly; and if this part of the work is well done, you will avoid the creaky, ready-to-tumble-down effect which is often the accompaniment of a portable glasshouse. You can buy sash-bars ready moulded at any timber yard; these should be partially let into the framework and fastened with screws. The lower part of the sides may be conveniently fitted with match-boarding, also fastened with screws. For the purpose of growing tomatoes, it will not be necessary to fix the glass with putty, but let each overlapping square of glass be held with a strip of sheet zinc, the whole being held in position by a narrow strip or lath of wood on each sash; this will facilitate removal while not materially injuring the efficiency of the house. As you say you can use a few tools, I have confined my remarks to a general outline only; you can set out your quantities from the drawing herewith.—C. M. W.

Fretwork Tool.—A. E. G. (*Leicester*). —The "best tool" for rebating fret frames—such as carte-de-visite photo frames—would, in my opinion, be a lathe with a small stout circular-saw, which would cut the rebate at one operation; but as it may be that the questioner has no lathe, he can cut the rebates with a cutting-gauge, having a short stiff cutter sharpened well, or he may use a gauge such as that used for inlaying lines in furniture, the tooth of which is a scraper, and removes wood in the form of dust-like shavings equal to its thickness. Either of these tools, used on the back and inner edge, will cut out the rebate almost to the corners, which can afterwards be cut out with a sharp chisel.—B. A. B.

Liquid Glue.—ANON.—There is no way of keeping any liquid glue in an open vessel to be ready for use at any time. Still less will "ordinary carpenters' glue," by any addition, remain liquid and equally useful. The usual solvent for liquid glue is very dilute nitric acid or acetic acid, but I should not use or recommend it for ordinary work. Bichromate of potash is sometimes added to glue: it is said to render glue insoluble after exposure to light. There are some fish glues and other special cements in liquid form, but all are expensive, and some have the acid to which the querist objects.—B. A. B.

American Organ.—J. H. (*Westleigh*).—Octave couplers can be bought or made, so can the fan for the vox-humana. If I had to fit both to an American organ, I should buy the octave coupler, but make the vox-humana. The octave coupler will cost 7s. 6d., one half up, and the other (bass) half down. Ask for Wilcox's patent wire coupler. The vox-humana consists of a fan, part of which revolves by the passage of air into the suction bellows, the rest of which passes along the back of the tube-board, having a cardboard sail affixed through the axis. The fan can be had for 2s. 3d. The casing of the actuating part and the valve will have to be made by the querist; but if he buys the fan, it will suggest at once how it is to be fitted. Dealers in fittings would do well to advertise prices in WORK. —B. A. B.

Enamel for Pony-trap.—T. E. B. (*Sidbury*).—Do you not mean varnish? A pony-trap is mostly of two or more colours—black and fancy colour—besides relief lines. One colour will not serve, unless all black; then carriage japan is used. If another colour as well is wanted, Whittingham & Wilkins, Long Acre, W.C., would match your colour, if such be desired, and send what you require, with suitable brushes. Even then the boot, nose-hoops, and parts of ironwork should be japanned. This they would supply, with colour for relief lines and pencils for use, if you could not get them elsewhere. Of course, the old varnish must be partially rubbed off with pumice-stone and water—solid and in fine dust—with woollen cloth pads. All rusty parts must be filed and touched in with priming or lead-colour before the rubbing down commences; that keeps the water from the iron and bare wood. The whole is then primed over with very thin lead-colour, and then a second time; then the fancy colour; then the relief lines; and, finally, copal varnish. Every coat of paint has to be flatted with pumice-stone and water, and washed very clean, and to be dry before another coat is put on. Be particular to take all you can apart to paint, and to put together again when all varnished and black parts are japanned. Avoid oil from axle and boxes of wheels touching any painted parts, by cleaning and washing with turpentine before beginning the job. Relief colours are sometimes only given to the fronts of spokes in the naves, and by a different coloured stripe being painted round mouldings and broad surfaces; these are laid on thin with suitable pencils. Varnish follows. This will be a ten or twelve days' job, and should look and wear well. But possibly touching up and varnishing might serve the purpose; this will only take three or four days to dry ready for use. You proceed as if you were about to repaint, by touching in rusty and bare places, first with lead-colour, then pumice-stone; dust off all surfaces, and touch up with match colour where wanted. Then varnish all over, and japan-black the parts. Keep all brushes swung by the handles in colour or varnish, and a card cover or a floorcloth one over the paint pots. Let all coats be well brushed in, and only the varnish a full coat.—J. C. K.

Dye for Branding Cattle.—J. H. M. (*County Meath*).—A preparation, of which an "aniline" dye is the basis, will be the thing for your purpose. Whether anything of the kind has hitherto been used for cattle we do not know, but this is what is used, in what are called "Homing Societies," for marking carrier pigeons, and what will do for the one will, of course, do for the other. You want a dye which will "last for a reasonable length of time." This will answer that requirement; indeed, you will not find it easy of removal. It is applied with a rubber stamp, which you can have made to

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any device or size. You see the advertisements of the makers of such stamps everywhere. You can get the prepared "ink" in either small or large quantities from Thornton, Redditch.—S. W.

Reviving Kid.—BASHER.—There are plenty of "kid revivers," sold as such, which will give the gloss you want. White of egg (albumen) will also do it. French polish—that is, shellac dissolved in alcohol—is also good to give a gloss to leather, but if used for your purpose, it would have to be very thin, and rubbed very lightly over the surface with a soft rag; if saturated with it, the kid would be rendered hard.—S. W.

Weather Glass.—H. McG. (*Cork*).—This correspondent asks how to construct a weather glass on the American system—*i.e.*, a liquid enclosed in a tube which. by the position and appearance of a crystalline deposit, indicates the "coming" weather. These glasses are really not weather indicators at all, except that they indicate to a certain extent the weather which *we are having*. They are made in two ways: either with a brass cap with a very minute hole in the top or hermetically sealed glass tubes. To make one, take a glass tube about 12 in. long and ¾ in. diameter. In this place the following composition: Camphor, 2 drachms; potassium nitrate (nitre), 1½ drachms; ammonium chloride (sal-ammoniac), 1 drachm; methylated spirit, 2¼ fluid ozs. Dissolve the camphor in the spirit, and the nitre and sal-ammoniac in as *little* water as possible. Add the two solutions together, and place in the tube. Draw out the end of the tube and seal up before the blowpipe. The action of these so-called weather glasses is really one of the variation of the amount of solid which can dissolve in a given liquid at variable temperatures.—J. G. L.

Machine for Grinding Edges of Glass.—I am sorry to say I cannot give you the address of a firm supplying these at present. I expect you mean the same kind as are used to prepare the glass for microscopic slides. Perhaps some of our readers, seeing this, may be able to help you; if not, I will bear it in mind, and hope to be able to let you know through "Shop" before very long.—W. E. D., JR.

Wiped Joint.—S. D. (*Harmondsworth*).—To make a joint similar to that termed a plumber's or wiped joint is not very difficult in some cases, such as when the pipes are easy of access and lying horizontally, but when the pipes are in awkward positions, then it is that considerable skill and practice are needed. In the case you mention, such as a burst pipe that you want to repair without cutting, proceed as follows: Close up the crack with a hammer; see that the water is all out of the pipe, or some distance below the flaw; scrape the pipe clean with a shave-hook or knife a little farther than the crack extends, and coat the pipes each side of the scraped part with "soil"—this is a technical term for a mixture of lampblack and glue-water, used on parts of the work where the metal is not wanted to stick. You must also be provided with some "wipes" or wiping cloths—they are usually made of fustian, two or three or more thicknesses stitched or folded together, and of various sizes, according to the work to be done. To make the joint, melt a quantity of plumbers' solder (two parts lead, one part tin) in a metal pot or large ladle; rub the part to be soldered with some tallow, and either pour or splash on to it with a flat stick the hot metal; it is usual to pour a little metal on to the joint to get the heat up (of course, with something underneath to catch it) before commencing to splash on the metal that is to make the joint. When sufficient metal is on the pipe, take a cloth in the hand and, bending it into a hollow shape, draw it round the joint. The metal should be sufficiently plastic to be wiped into the proper shape, which is something like a long egg—no doubt you know that. Two or three trials in the workshop after these hints will soon show you whether you can manage it or not. If the metal gets cold before you have properly shaped the joint, you must warm it up again with an iron.—R. A.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Fretwork.—J. McC. (*North Brixton*) writes:—"Would any reader kindly inform me where to procure a cheap and simple book of instructions to beginners in fretwork?"

Fernery.—E. H. (*No Address*) writes:—"I shall feel obliged if a brother reader will give me a design for a fernery for a window, with advice as to about putting in the ferns."

Bagatelle.—W. E. (*Battersea, S.W.*) writes:—"I am anxious to make a French bagatelle table, but not knowing the different bells, holes, etc., perhaps some reader would kindly give me information on the subject."

Address.—LABOURER asks for the address of Adams & Bishop, Publishers, New York, U.S.A.

Carriage Monograms.—COACH PAINTER writes:—"Will some reader please give me two designs of monograms, 'M.W.C.' and 'P.L.G.,' suitable for coach painting?"

Match Making.—T. M. (*Wakefield*) writes:—"Will someone tell me how to mix match brimstone, how many kinds of materials there are, and how mixed up together?"

Tin—Geometry.—YOUNG READER writes:—"Will any reader tell me whether large quantities of good tin canisters could be sold or turned to any account? Also, I want a good book on geometry for beginners."

Steel Blue.—A. B. (*Sheffield*) writes:—"I should be pleased if any reader would tell me how to get blue off steel after stiffening."

Fire Lighters.—W. B. (*Queensbury*) will thank any reader to state the best way of making fire lighters.

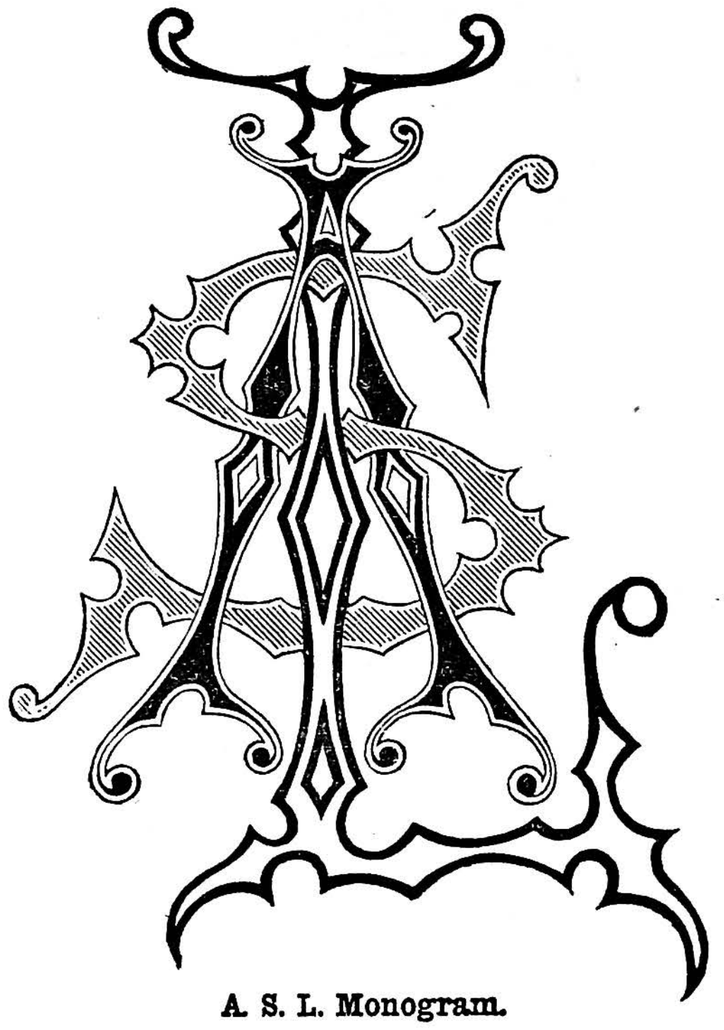
Label Damper.—W. C. (*Banbury*) writes:—"Will any reader kindly furnish, through 'Shop,' the name and address of firm manufacturing label dampers similar to those supplied to Hudson's?"

W. H. R. Monogram.—W. H. R. (*Commercial Road*) will thank a brother reader for a monogram for W. H. R. for carving in a circle 2½ in.

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Leather Work.—A READER writes, in reply to J. B. M. (*Blairgowrie*) (see No. 156, page 830):—"Walter Strachan, Novelty Leather Worker, Bervie, N.B., will undoubtedly furnish you with the necessary information."

A. S. L. Monogram.—J. B. writes, in answer to R. R. (*Greenock*) (see No 156, page 830):—"I hope the monogram design below will be of use to you for the top of workbox."



A. S. L. Monogram.

Syrups.—J. H. (*Newton Moor*) writes, in answer to W. W. (*Glasgow*) (see No. 159, page 46):—"A book published by E. Skuse, Praed Street, London, W., on 'Syrups and Aerated Waters,' will meet all requirements."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. B. (*New Cross*); LITTLE JIM; AMATEUR BALLOONIST; T. H. D. (*Wood Green*); NOVICE; C. W. D. (*Hammersmith, W.*); W. H. (*Peterborough*); PAINO; C. H. D. (*Shepherd's Bush, W.*); HYDRAULIC DRIVER; A NEW READER; J. A. (*Thirsk*); T. B. (*Great Orton*); G. G. (*Farnworth*); TOM; E. H. (*Bethnal Green*); HYSTERESUS; S. W. (*Ashton-under-Lyne*); A. S. B. (*Loughborough*); TAXIDERMIST; H. A. H. (*Leeds*); F. W. R. (*Sunderland*); R. T. (*Hounslow*); DOUBLE GEAR; D. B. (*New Mills*); G. E. W. (*Swanley Junction*); J. G. (*Bala, N. Wales*); W. H. S. B. (*Derby*); D. B. D. (*Penryn, Cornwall*); ONE WHO WISHES TO KNOW; W. G. G. (*Hornsey Road*); W. J. B. (*Londonderry*); A. T. (*Macclesfield*); S. J. (*Failsworth*); E. C. (*Leyton*); A. F. (*Ovenden*); F. H. W. (*Liverpool*); NEMO; R. A. K. E. (*Peckham*); AMATEUR; R. T. (*Glasgow*); E. K. (*Smethwick*); W. W. (*Aylesbury*); J. R. B. (*Accrington*); G. C. (*Stratford-on-Avon*).

"WORK" PRIZE COMPETITIONS.

THE Editor of WORK has the pleasure of calling the attention of his readers to the following scheme for Prize Competitions, which he will feel obliged by their bringing under the notice of friends and others interested in any of those departments of work, or employment, which the prize scheme is intended to stimulate.

Fully sensible of the interest which many thousands of the readers of WORK take in matters of a competitive nature, this prize scheme has been deemed a suitable sequel to the WORK Exhibition, in which so many readers obtained honours.

It is manifest that a prize scheme to appeal to the varied constituencies of WORK readers could not be covered by one competition. Therefore our plan must necessarily be given in separate instalments. We shall, however, endeavour to arrange that all our readers—professional and amateur, craftsmen, apprentices, and hobbyists—shall be cared for in turn.

A general subject has been considered best with which to commence; and as most of the readers of WORK and thousands of the outside public know something of bicycles and tricycles, competition is invited for the best essay upon

"The Cycle: Its Worth to the Nation."

For the three best essays the following prizes will be awarded—

First Prize, £3;
Second Prize, £2;
Third Prize, £1.

CONDITIONS AND RULES OF THE CYCLE ESSAY COMPETITION.

ALL Essays to bear the WORK Prize Coupon, cut from one of the numbers of WORK in which the prize scheme is announced.

Each Essay to be signed with an original *nom de plume*, and to have the writer's real name and address securely attached to the manuscript in a sealed envelope.

No Essay to exceed more than two pages of WORK in extent, including any diagrams that may be necessary to elucidate the text.

In the work of judging regard will be had to original suggestions of value affecting the improvement of bicycles and tricycles, especially where such improvements are shown by diagrams.

All Prize Essays and Drawings to be published, if desired by the Editor, in WORK, but the copyright thereof to remain with the authors.

Copies of MSS. and Drawings to be retained by the competitors, as in no case can the return of MSS. be undertaken.

The Editor of WORK will supervise the judging of the Essays, and the selection as determined upon is to be final.

All manuscripts intended for the Cycle Essay Competition must be addressed to the Editor of WORK, c/o Cassell & Co., Ld., Ludgate Hill, London, E.C. They must reach him not later than Saturday, June 25, and should be legibly endorsed on the envelope or wrapper, "WORK Cycle Essay Competition."

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100 Fretwork Designs (new), 100 Carving, 100 Repoussé, 30 Fret Brackets, 100 Sign Writer's Stencils (all full size), 300 Turning, 400 Small Stencils. Each packet, 1s.; postage free.—F. COULTHARD, Darlington Street, Bath. [1 S

Fretwork Designs.—40, 7d.; 12 brackets, 1s. 1d. Catalogue 300 miniatures, 6d. Lists free.—TAYLOR'S Fretworkeries, Blackpool. [18 R

Picture Moulds.—15 to 25 per cent. saved. Send for wholesale list, one stamp.—DENT'S, Importers, Tamworth. [12 R

Small Tube Copper Boiler for sale; also Model Engine, in good condition; or exchange Safety Bicycle.—WM. THOMPSON, Robinson Street, Houghton-le-Spring, Co. Durham. [19 R 3

Wanted to Purchase.—Vols. II. and III. of WORK. State price to A. FENSOM, 58, Ordnance Road, Canning Town, E. [2 S

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